UNIVERSITÀ CATTOLICA DEL SACRO CUORE
Sede di Piacenza

Dottorato di ricerca per il Sistema Agro-alimentare
Ph.D. in Agro-Food System

Cycle XXXIV
S.S.D. BIO/19, AGR/16, MED/07

Safety demonstration of microbial species Risk assessment of specific microbial strains for use in the food chain

Candidate:

Bourdichon François

Matriculation n: 481476

Academic Year 2020/2021

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"Non fa scienza, sanza lo ritenere, avere inteso"

(Avoir entendu sans retenir ne fait pas de la science)

Dante (Paradiso, V, 41-42, 1321)

"Douter de tout ou tout croire, ce sont deux solutions également commodes, qui l'une et l'autre nous dispensent de réfléchir"

(Dubitare di tutto o credere a tutto, sono due soluzioni ugualmente comode, dato che entrambe ci dispensano dal dover riflettere)

Henri Poincaré La science et l'hypothèse, 1902.

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Abstract

Fermented foods have been consumed for more than 10 000 years. Food fermentation is probably one of the oldest food technologies implemented by man, although the scientific knowledge behind its role and mechanisms of actions have only been studied in the past 150 years. Presently, fermented food products are estimated to represent a third of our food intake.

Food Microbiology has provided many answers behind the roles, modes of action, nutrition and health effects of fermented foods. One of the major topics of concern nevertheless remains the safety demonstration of the microbial food cultures. Most recently, in late 2017, China blocked the importation of cheeses from Europe, due to the presence of microbial food cultures not present in the Chinese 2010 positive list.

Europe (Biohazard Panel – Qualified Presumption of Safety) and United States (GRAS – Generally Recognized as Safe) also have a procedure in place respectively for the microbial risk assessment of microbial species voluntarily added to the food chain. The International Dairy Federation (IDF), in collaboration with the European Food and Feed Cultures association, has been working for the past 20 years on an inventory of microbial species with technological properties in fermented foods.

During the 3 years cycle, we have continued the work of the IDF, updating twice the inventory, in 2018 with the introduction of microbial food species from indigenous Asian food products, and in 2021 while considering the various food matrices and food usage attributable to a single microbial species.

As such, we have focused the work on the role of food cultures and food bio-preservation, as initially suggested by the initial rationale of demonstration of food cultures of the IDF. As a proof of concept of the approach of safety demonstration of a food culture, the analytical work has been done of a collection of food and clinical isolates of the microbial species *Weissella confusa*, which can be both isolated in bakery products (Europe), plant-based products (Asia) and with preliminary studies for its used in dairy food products.

The present study will propose a safety demonstration of microbial species for its use through inoculation in a food matrix for use in the food chain. It is aimed to avoid barrier trades between countries where a history of safe use cannot be established for an indigenous fermented food products on international market, as well as avoiding the pitfalls of cross over fermentation, while changing the food matrix where the food fermentation is done, and possibly omitting deleterious metabolites activities.

Academic Year 2020/2021

Introduction

Early September 2017, China did put a ban on the importation of European cheeses. The ban started in July and August in some major cities, and was officially extended nationally early September.
Specifically, soft cheeses such as Stilton Blue Cheese (UK), Danish Blue Cheese (DK), Camembert, Brie and Roquefort (FR) and lastly Gorgonzola (IT) were implicated in the ban.
Food adulteration? Ongoing foodborne outbreaks?
Penicillium roqueforti and *Penicillium camemberti* as microbial food cultures were the common factor and reason for the ban of these famous, tasty(?) cheeses with a long history of safe use. The decision was based upon the Chinese 2010 list of food cultures allowed in foods from the Ministry of Health. Chinese health regulations permit only a few types of food cultures in fermented food products. While there is an exemption for "cultures that are traditionally used for food production", that exemption does not apply to imported goods.
The ban was short-lived and lasted two months. Following a round of meetings between European Commission representatives and Chinese quarantine and health officials, China reversed the ban in late October, effective immediately. Since then, multiple technical meetings have occurred between Chinese and European microbiologists to update the regulatory status of microbial food cultures in China. A new GB standard (Guobiao - 国标 -, Chinese standardization scheme) is presently going (late 2021) through public consultation before final publication. In these new sets of standards, the positive list of 2010 and following updates is expected to be taken out, while the technical details of safety demonstration and safety dossier to do will be detailed.
China has been working recently in the update of the food cultures found in indigenous traditional fermented foods, going presently through the same process Western countries (Europe, United States) had been going in the previous decades (Yao *et al*., 2021). International trade of fermented food products, research in understanding of the mechanisms of action of food cultures to get out of the historical black box approach, consumer acceptance and regulatory hurdles for the use of microorganisms in the food chain: all these situations have put the traditional food processes and cultural usage in the spotlight and raised, necessary or not, various concerns about the conditions of use and safety of the traditional indigenous fermented foods, and their constitutive food cultures, inoculated or not.

Food Fermentation. Microbial Food Cultures

Fermentation is probably one of the oldest food technologies used by man, dating back to Palaeolithic times. For millennials, the approach was exclusively empiric, with little if no awareness of the role played by the microbial communities. The importance of food fermentation is still underestimated in the Western societies, where the focus on Dairy fermented products provides a consumer bias in the understanding of the incredible variety of fermented food products, which are expected to represent a third of our food intake (Steinkraus, 2002).
Despite its role in every day life, there is not presently any consensual definition (and therefore understanding) of what food fermentation precisely mean.

In his 2002 review, Steinkraus proposed 5 roles to be considered for fermentation in food processing:

(1) Enrichment of the human dietary through development of a wide diversity of flavours, aromas and textures in food
(2) Preservation of substantial amounts of food through lactic acid, alcoholic, acetic acid, alkaline fermentations and high salt fermentations
(3) Enrichment of food substrates biologically with vitamins, protein, essential amino acids and essential fatty acids
(4) Detoxification during food fermentation processing
(5) A decrease in cooking times and fuel requirements

These roles were readdressed by the International Dairy Federation (IDF) in the 2012 publication of the second update of the inventory of food cultures (Bourdichon et al., 2012a, 2012b):

(1) Preservation of food through formation of inhibitory metabolites such as organic acids (lactic acid, acetic acid, formic acid, propionic acid), ethanol, bacteriocins, etc, often in combination with decrease of water activity (by drying or use of salt)
(2) Improving hygiene through inhibition and even elimination of food pathogens
(3) Detoxification of food (e. g. removal of cyanogens, goiterogens, etc)
(4) Improving wholesomeness through improved digestibility of polymers after removal of flatulence-causing compounds
(5) Enrichment of food substrates with essential nutrients (vitamins, proteins and essential amino acid, fatty acids, etc) and enhanced bioavailability of food components through catabolism of the food matrix
(6) Organoleptic properties through effects on flavour, texture and colour: flavour compounds are produced by microorganisms during the initial fermentation step or during subsequent ripening

Most recently, the International Scientific Association of Probiotics and Prebiotics (ISAPP) published a review paper on fermented foods as well (Marco et al., 2021), where food fermentation *per se* was not defined, but as done by Steinkraus and the IDF, the outcome, namely fermented food products, as: "foods made through desired microbial growth and enzymatic conversions of food components".

History of (safe) use

One of the focuses on the safety demonstration of microbial food cultures originates either in Europe or in North America for the evaluation of novel foods products, either through the European Novel Food Regulation (Regulation (EC) No 258/97 of the European Parliament and of the Council of 27 January 1997 concerning novel foods and novel food ingredients) or the United States – Food and Drug Administration (US – FDA) Generally Recognized as Safe (GRAS) regulation. When it comes to the novel food process evaluation, Europe consider 1997 as a milestone, US-FDA 1958. And science? Considering the history of use can be complicated, and the wording use in microbiology to mention the "origin" of a micro-organism instead of its "isolation" is not helpful. Recently, the phrasing has been adapted, but education is still needed.

In December 2004, during the second scientific colloquium of EFSA about the Qualified Presumption of Safety of Micro-organisms in Food and Feed (QPS), it was agreed that "a long history of apparent safe use of a given micro-organism or micro-organisms for the making of a given food or feed product suggests a very high safety level for the consumption of such products". Even so, the application in food of a microbial strain belonging to a species with an accepted history of safe use remains subject to consideration of the potential presence of undesirable traits that are of a safety concern (Leuschner et al., 2010).

While "history of use" is found on 21 pages out of 144 of the QPS scientific colloquium report, the concept is not defined in the global report, leaving the appreciation of what is historical and what is not to other stakeholders. This point was tentatively addressed by the IDF expert group, following a survey, and lack of clear definition, in the different regulations in place. One definition of 'history of safe use' proposes "significant human consumption of food over several generations and in a large, genetically diverse population for which there exist adequate toxicological and allergenicity data to provide reasonable certainty that no harm will result from consumption of the food" (Health Canada, 2003). A history of apparent safe use is not limited to use over a long period; it also includes factors such as the level of exposure to a micro-organism. A history of apparent safe use does not, in itself, constitute a risk assessment. Furthermore, no assurances can be made that something is absolutely safe.

An appropriate history of safe use does, however, provide evidence in support of a "reasonable certainty of no harm". The history of use, in a nutshell, replace the exposure assessment part of the risk assessment framework proposed in the risk analysis guidelines of the FAO; it is therefore necessary but far from sufficient to consider that any isolate of the evaluated microorganism's species is safe (FAO, 2007)

The traditional use of microbial food cultures was tentatively placed in the QPS colloquium in the three following categories:

1. Spontaneous fermentation processes *i.e.* without any microbial food cultures added intentionally, and so-called back-slopping processes where an undefined mixture of micro-organisms, naturally present in a product, is recycled. Products of such processes include e.g. olives, cream and sourdough-based bread;
2. Processes based on deliberately added, but undefined microbial mixtures, which were not originally part of the natural flora in the raw material. An example of the use of an undefined microbial mixture is Kefir;
3. Processes using defined microbial food cultures, which are identifiable at the strain level.

Microbial food cultures per se do not have a clear definition either, and even a clear regulatory status. There is presently an ISO standard in place, ISO 27205:2010 [IDF 149:2010] standard for Fermented milk products — Bacterial starter cultures — Standard of identity, which "specifies characteristics of industrial bacterial starter cultures, which are principally lactic acid bacteria (LAB), but which also include *Bifidobacterium* and *Propionibacterium* used for the manufacture of fermented milk products such as yoghurt, sour cream, cultured butter and cheese", but does not apply to bacterial cultures which are added as an ingredient to foods only because of their probiotic properties. (https://www.iso.org/standard/44069.html). This standard is presently under revision (Chaired by the IDF) to extend its scope to non-dairy and non-bacterial food cultures. Part of the safety demonstration of the microbial food cultures is also to define them. This is a small yet significant gap with the QPS approach with the QPS internal assessment of EFSA, that addresses the microorganisms voluntarily added in the food chain, and not all of them are defined as microbial food cultures, as they do not necessarily play a technological role in food fermentation.

Probiotic cultures are specifically addressed in the FAO/WHO 2001 & 2002, compiled 2006 reports (FAO/WHO, 2001, 2002, 2006). From the concept and terms used until know, Probiotic is the only one which is precisely defined and consensually recognized: "live microorganisms which when administered in adequate amounts confer a health benefit on the host". Yet even with 20 years and plus definition, and clear guidelines, the use (and abuse) of probiotics remains a concern when it comes to their safety and precaution of use, adding more substance to the global concerns on microbial food cultures. Most particularly, the abuse of probiotics for specific uses, and medical purpose, which is already mentioned in the 2001 report as biotherapeutic agents. The concept of biotherapeutic agents is clearly regulated, at least in the United States and Europe (Cordaillat-Simmons et al., 2020). Either probiotic or biotherapeutic, these microorganisms fall into the scope of the safety demonstration of both GRAS and QPS, and the lack of precaution from many (sometime significant) operators have put a doubt on their safe use (Pararajasingam and Uwagwu, 2017).

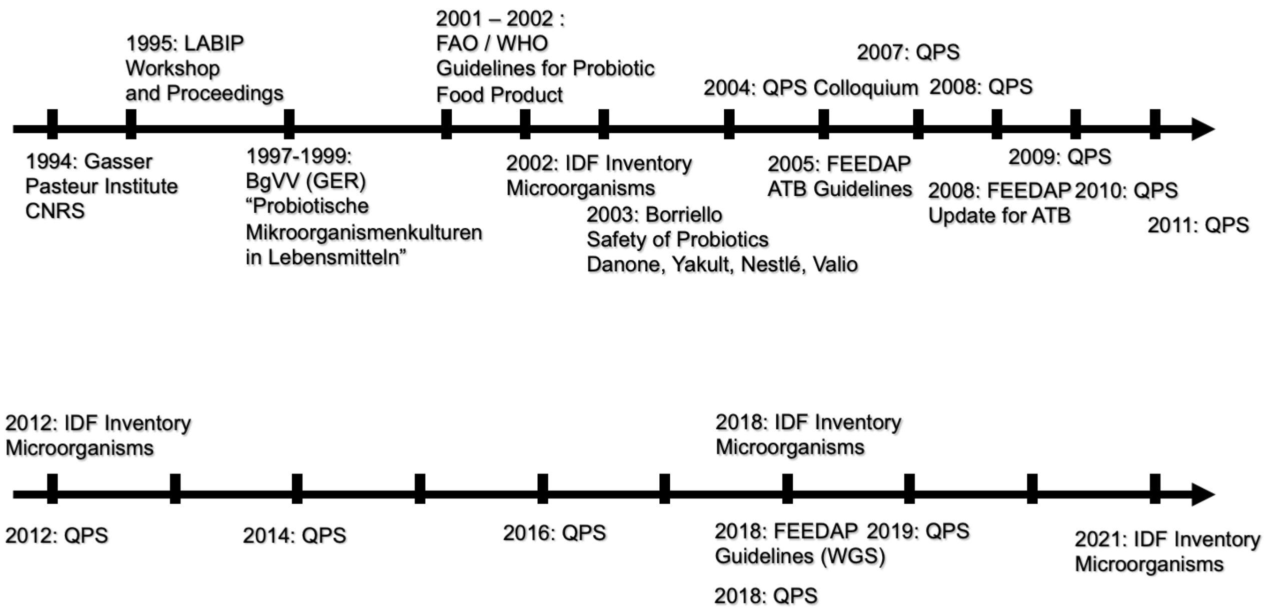
Safety considerations

According to the FAO/WHO expert panel in the 2002 report, probiotics have been proposed to be theoretically responsible for four types of side-effects (Marteau, 2001):

1. Systemic infections
2. Deleterious metabolic activities
3. Excessive immune stimulation in susceptible individuals
4. Gene transfer

These side effects were revaluated by the IDF expert group in the 2012 Publication set (Bourdichon et al., 2012a, 2012b) with small modifications.

There has been indeed a growing evidence of safety considerations in the past thirty years, as shown in the following time line, from 1994 to 2021 with a selection of relevant milestones:



In his 1994 review in the "Bulletin de L'Institut Pasteur", Pr. Francis Gasser addressed one of the first reviews on the evidence of safety of Lactic Acid Bacteria and their clinical isolations (Gasser, 1994). This initial work was followed by a specific workshop of LABIP – Lactic Acid Bacteria Industrial Platform and position from the BgVV – Bundesinstitut für Gesundheitlichen Verbraucherschutz und Veterinärmedizin – of Germany in 1999 (BgVV, 1999). FAO/WHO experts reports followed in 2001 and 2002 with a proposal for the safety assessment of probiotic candidate strains, while the International Dairy Federation published its first edition of the inventory of food cultures in order to establish the history of safe use and answer regulatory expectations (Mogensen et al., 2002a, 2002b). A joint expert group at the initiative of industrial key players reviewed the available evidence in 2003 (Borriello et al., 2003). The QPS initiative started with the second EFSA scientific colloquium in December 2004, and has been regularly updated and extended since then (Leuschner et al., 2010; Herman et al., 2018). The key milestones of the QPS are detailed on the EFSA Website (https://www.efsa.europa.eu/en/topics/topic/qualified-presumption-safety-qps#milestones)

Among the major point of concern, the gap of understanding between clinical and food microbiologist when it comes to the assessment of Lactic Acid Bacteria is particularly "interesting". None of the commonly used food cultures, even when causing a relative harm, falls into the scheme of the 1890 Koch's postulate, or even the recently proposed molecular ones (Falkow, 1988)

As originally stated, the four criteria are:

(1) The microorganism must be found in diseased but not healthy individuals
(2) The microorganism must be cultured from the diseased individual
(3) Inoculation of a healthy individual with the cultured microorganism must recapitulated the disease

(4) The microorganism must be re-isolated from the inoculated, diseased individual and matched to the original microorganism.

As for lactic acid bacteria, the postulates 1, 3 and 4 do not apply: through fermented food products, one can reasonably considere that the global world population is exposed, hence as previously mentioned the lack of exposure assessment relevance and the alternative consideration of history of safe use. Nevertheless, Lactic Acid Bacteria are sometimes classified as pathogens of concern and infectious substances by clinical microbiologists (e.g., Government of Canada: https://www.canada.ca/en/public-health/services/laboratory-biosafety-biosecurity/pathogen-safety-data-sheets-risk-assessment/lactobacillus.html), despite 10 000 years at least of history of safe use. *Lacticaseibacillus rhamnosus* (Former taxon *Lactobacillus rhamnosus*) is even classified class 2 in Germany (https://www.baua.de/DE/Angebote/Rechtstexte-und-Technische-Regeln/Regelwerk/TRBA/pdf/TRBA-466.pdf?__blob=publicationFile&v=11), after reports of opportunistic infections in the 1990's by Professors Klein and Reuter (Freien Universität Berlin, Germany).

Opportunistic Infections to Lactic Acid Bacteria

Correlation is not causation, and isolation of a microorganism where the medical dogma expect microbial sterility can lead to quite "interesting" conclusions (Mofredj et al., 2007). When considering the prevalence of opportunistic infections to Lactic Acid Bacteria, one can start by considering the available evidence in the scientific literature. The review of opportunistic case report as presently done by EFSA Biohazard Panel is based on literature database web search using following keywords in the Appendix C – Search strategies for the maintenance and update of list of QPS-recommended biological agents (EFSA, 2018).

As an example, for *Bifidobacterium* spp:

***Bifidobacterium* spp.**

String for species	
"Bifidobacterium adolescentis" OR "Bifidobacterium animalis" OR "Bifidobacterium bifidum" OR "Bifidobacterium breve" OR "Bifidobacterium longum" OR "B adolescentis" OR "B animalis" OR "B bifidum" OR "B breve" OR "B longum"	
OUTCOME	**String**
1. Antimicrobial/Antibiotic/Antimycotic	"antimicrobial resistan*" OR "antibiotic resistan*" OR "antimicrobial susceptibil*"
2. Infection/Bacteremia/Fungemia/Sepsis	"infection*" OR "abscess*" OR "sepsis*" or "septic*" OR "bacteremia" OR "bacteraemia" OR "toxin*"
3. Type of disease	"endocarditis" OR "abscess" OR "meningitis"
4. Mortality/Morbidity	"clinical*" OR "death*" OR "morbidit*" OR "mortalit*" OR "disease*" OR "illness*"
5. Disease Risk	"opportunistic" OR "virulen*"

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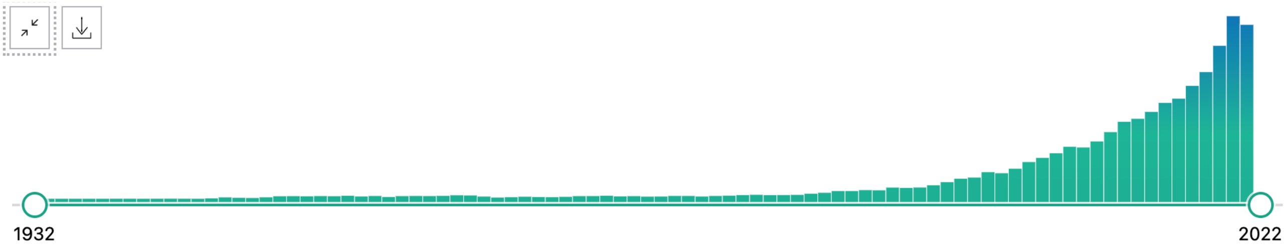
This screening approach has its limitation. Considering these research keywords for *Lactobacillus* spp. (former taxon), reported cases such as Pararajasingam and Uwagwu, 2017 (Case report of Probiotic Infection) would not be identified. Opportunistic infections of *Lactobacillus* spp. (former taxon) and *Bifidobacterium* spp. are also not restricted to endocarditis and meningitis. Several cases of peritonitis, hepatitis, canaliculitis, cellulitis, cholangitis, cholecystitis, chondritis, colitis, empyema, enteritis, onset of fever, gastroenteritis, oesophagitis, osteomyelitis, pyelonephritis, urosepsis, vaginitis… have been reported. The picture is presently clearly underestimated in its reporting and its description as done by the EFSA QPS Panel.

We extended the search of case report by an evolution of the search terms: for each type of infection described, the word is further inserted in the keywords. We also addressed potential publication not available in PubMed – NCBI database or others by a review of the references used in the previously identified case reports.

The proposed search terms are: (Accessed November 24, 2021 on Pubmed: 59756 Hits, 9571 Reviews)
Abscess or bacteraemia or bacteremia or canaliculitis or (case and report) or cellulitis or cholangitis or cholecystitis or chondritis or colitis or diarrhea or empyema or endocarditis or enteritis or fever or gastroenteritis or infection or lactobacillemia* or leukaemia or leukemia or meningitis or neutropenia or oesophagitis or osteomyelitis or peritonitis or pneumonia or purpura or pyelonephritis or sepsis or septicaemia or septicemia or urosepsis or vaginitis) and (*Lactobacillus* or Probiotic* or *Bifidobacterium* or *Lactococcus* or *Leuconostoc* or (*Streptococcus* and *thermophilus*) or *Weissella*



Timeline of the 59756 on opportunistic infection to LAB. Pubmed, 2021-11-24.

Not all the hits are proposing the report of a clinical infection, and it has been necessary to investigate further through a case by case reading approach. The following table has been done: opportunistic infections tables for Lactic Acid Bacteria (Lactobacillus former taxon, Leuconostoc, Weissella, Streptococcus) and Bifidobacteria (Appendix 1).

This approach has been used specifically for the safety demonstration of *Weissella confusa*, allowing the identification of 49 cases in 19 reports. See publication #4 of the present report:
Bourdichon, F., Patrone, V., Fontana, A., Milani, G., and Morelli, L., 2021. Safety demonstration of a microbial species for use in the food chain: *Weissella confusa*. International Journal of Food Microbiology 2;339:109028. doi: 10.1016/j.ijfoodmicro.2020.109028. Epub 2020 Dec 16. PMID: 33352462.

Two recent publications on *Weissella confusa* report cases and review of the literature propose less reported cases that our research scheme, highlighting the limitation of the research to the relevance of the criteria used and the consideration of only one database without further bibliographical investigation (Spiegelhauer et al., 2020, Hurt et al., 2021).

Antibiotic Resistance

The Antibiotic resistance of Food cultures is a point specifically addressed in the Guidelines of the EFSA's Panel on Additives and Products or Substances used in Animal Feed (FEEDAP) in the first guidelines of 2005, 2008 and most recently the Guidance on the characterisation of microorganisms used as feed additives or as production organisms (FEEDAP, 2018).

The proposed microbiological cut-off values (mg/L) for specific microbial species have been established base on the data generated from the European project ACE-ART (Assessment and critical evaluation of antibiotic resistance transferability in food chain - https://cordis.europa.eu/project/id/506214/reporting/fr) (Domig et al., 2008)

Table 2: Microbiological cut-off values (mg/L)

	Ampicillin	Vancomycin	Gentamicin	Kanamycin	Streptomycin	Erythromycin	Clindamycin	Tetracycline	Chloramphenicol	Tylosin	Ciprofloxacin	Colistin	Fosfomycin
Lactobacillus obligate homofermentative[(a)]	2	2	16	16	16	1	4	4	4	n.r.	n.r.	n.r.	n.r.
Lactobacillus acidophilus group	1	2	16	64	16	1	4	4	4	n.r.	n.r.	n.r.	n.r.
Lactobacillus obligate heterofermentative[(b)]	2	n.r.	16	64	64	1	4	8[(c)]	4	n.r.	n.r.	n.r.	n.r.
Lactobacillus reuteri	2	n.r.	8	64	64	1	4	32	4	n.r.	n.r.	n.r.	n.r.
Lactobacillus facultative heterofermentative[(d)]	4	n.r.	16	64	64	1	4	8	4	n.r.	n.r.	n.r.	n.r.
Lactobacillus plantarum/pentosus	2	n.r.	16	64	n.r.	1	4	32	8	n.r.	n.r.	n.r.	n.r.
Lactobacillus rhamnosus	4	n.r.	16	64	32	1	4	8	4	n.r.	n.r.	n.r.	n.r.
Lactobacillus casei/paracasei	4	n.r.	32	64	64	1	4	4	4	n.r.	n.r.	n.r.	n.r.
Bifidobacterium	2	2	64	n.r.	128	1	1	8	4	n.r.	n.r.	n.r.	n.r.
Pediococcus	4	n.r.	16	64	64	1	1	8	4	n.r.	n.r.	n.r.	n.r.
Leuconostoc	2	n.r.	16	16	64	1	1	8	4	n.r.	n.r.	n.r.	n.r.
Lactococcus lactis	2	4	32	64	32	1	1	4	8	n.r.	n.r.	n.r.	n.r.
Streptococcus thermophilus	2	4	32	n.r.	64	2	2	4	4	n.r.	n.r.	n.r.	n.r.
Bacillus	n.r.	4	4	8	8	4	4	8	8	n.r.	n.r.	n.r.	n.r.
Propionibacterium	2	4	64	64	64	0.5	0.25	2	2	n.r.	n.r.	n.r.	n.r.
Enterococcus faecium	2	4	32	1,024	128	4	4	4	16	4	n.r.	n.r.	n.r.
***Corynebacterium* and other Gram-positive**	1	4	4	16	8	1	4	2	4	n.r.	n.r.	n.r.	n.r.
Enterobacteriaceae	8	n.r.	2	8	16	n.r.	n.r.	8	n.r.	n.r.	0.06	2	8

n.r.: not required.
(a): Including *L. delbrueckii, L. helveticus*.
(b): Including *L. fermentum*.
(c): For *L. buchneri* the cut-off for tetracycline is 128.
(d): Including the homofermentative species *L. salivarius*.

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ISO 10932|IDF 223:2010 - Milk and milk products — Determination of the minimal inhibitory concentration (MIC) of antibiotics applicable to bifidobacteria and non-enterococcal lactic acid bacteria (LAB) is the international standard of reference used for phenotypic antibiotic susceptibility testing (https://www.iso.org/standard/46434.html)

This standard was last reviewed and confirmed in 2020. Considering the outcome and comments of the systematic review and the technical discussions within the International Dairy Federation, the existing standard could be improved in respect to several areas:

- Update the standard in respect to up-date taxonomy.
- Removal of the currently included supplier of antibiotic panels that are no longer on the market.
- More sustainable by use of less antibiotics and plastics and support longer shelf life of medium.
- Clear guidance for antibiotic susceptibility testing of food cultures will reduce the burden of antibiotic resistance in the food chain.
- Increase the quality of MIC data by better description of how to read MIC data (in line with EUCAST reading guidance), how to evaluate MIC data of test strains and control strains.
- Include the options to use equipment for standardizing the inoculum, reading devices to assisting the reading of MIC values with automated solutions for data transfer, or other options for automatization.
- Extension with more "reference" strains in the interlaboratory trial (e.g. include *L. delbrueckii* subsp. *lactis*)

The standard include testing of 16 antibiotics some of which are not clinically relevant for lactic acid bacteria. The range of antibiotics included in the standard are overlapping with the EFSA FEEDAP (2005) guidance: 14 of the 16 antibiotics were requested by EFSA at the time of development of the standard. Considering the lack of clinical relevance, only nine antibiotics of the present standard are required and considered relevant in EFSA present assessment.
Under the initiative of the International Dairy Federation, the following action are presently ongoing=

- Survey IDF and ISO member countries for antibiotics of interest,
- Prioritization of the antibiotics currently in the EFSA guidance and others with a global interest.

For most of the relevant antibiotics, quality control parameters and cut-off values are set in the current standard and EFSA guidance, respectively.

- Methodology for testing of other antibiotics not included in the current standard including how to handle quality control strains and the interpretation of MIC data for which no cut-off values are provided.

On a regulatory perspective, it would be more efficient to provide the guidelines for setting the MIC values and introduce new species of interest, particularly in the context of major changes of taxonomy for *Lactobacillaceae* and *Leuconostocaceae* (Zheng et al., 2020)

Food Fermentation as end use of microbial food cultures: History of safe use

The history of safe use, despite a lack of a definition, is the major aspect pushed forward when setting the safety of microbial food cultures. As expected by the QPS panel of EFSA, this is a key component of the body of knowledge of a microbial species of interest.
The International Dairy Federation initiative on the inventory of microbial food cultures uses the demonstration of food usage of a microbial species in a food matrix as the key demonstrator of the history of safe use (Bourdichon et al, 2012c, 2012b).
The history of safe use of a food culture is linked to the food matrix(ces) it has been recognized to be used traditionally. This microbial food culture – food matrix approach is the major point of difference in the rationale of the International Dairy Federation list of food cultures, when comparing to the EFSA QPS List (Bourdichon et al., 2019).
There is a trend recently in the food fermentation research to assess the use of species historically isolated in a type of food matrices in other food types. Dank and co-authors (Dank et al., 2021) introduced most recently the concept of cross-over fermentations, “processes in which a microorganism from one traditional fermentation process is introduced onto a new substrate and/or to a new partner”. The traditional use however, which grants a history of safe use, is not applicable

anymore and a specific safety demonstration for this new food usage must be demonstrated (Capozzi et al., 2017; Capozzi et al., 2018). Even if a microorganism originates from an established traditional/artisanal fermented food, a thorough safety examination has to be performed also at the strain level before it is used as a food culture (Capozzi et al. 2018).

During the period of the PhD, we worked on the 3rd update (2018) and 4th update (2021) of the International Dairy Federation of microbial food cultures, considering the extension beyond dairy and multiple documented food usages for each species.
See publication #1 & #2 of the present report:
#1: Bourdichon, F., Alper, I., Bibiloni, R., Dubois, A., Laulund, S., Miks, M., Morelli, L., Zuliani, V., Yao, S., 2018. Inventory of Microbial Food Cultures with safety demonstration in fermented food products. Update of the Bulletin of the IDF 455-2012.
#2: Bourdichon, F., Budde-Niekiel, A., Fritz, D., Hatte, J.L., Laulund, S., Mac Auliffe, O., Ouwehand, A., Yao, S., Zgoda, A., Zuliani, V., Morelli, L., 2022. Bulletin of the IDF N° 514/2022: Inventory of microbial food cultures with safety demonstration in fermented food products. Update of the Bulletins of the IDF 377/2002, 455/2012 and 495/2018.

Food Fermentation as end use of microbial food cultures: Biopreservation

In its recent proposal definition of fermented foods (Marco et al., 2021), the ISAPP expert panel considered briefly the potential role of microbial food cultures in biopreservation of food products: fermented food products have indeed a longer shelf life after transformation of the raw material. This role should be historically considered as the reason for use of food cultures in the early stages of pastoralism, empirically indeed but definitively a most relevant point to consider. This point was already suggested in the roles of fermentation in the food chain in the work of the International Dairy Federation (Bourdichon et al., 2012a, 2012b) and was further investigated and submitted for peer review: see publication #3 of the present report:
Bourdichon, F., Arias, E., Babuchowski, A., Bückle, A., Bello, F.D., Dubois, A., Fontana, A., Fritz, D., Kemperman, R., Laulund, S., McAuliffe, O., Miks, M.H., Papademas, P., Patrone, V., Sharma, D.K., Sliwinski, E., Stanton, C., Von Ah, U., Yao, S., and Morelli, L., 2021. The forgotten role of food cultures. FEMS Microbiology Letters 368(14):fnab085. doi: 10.1093/femsle/fnab085.

Publication #1 – Bulletin of the IDF N° 495/2018: Inventory of microbial food cultures with safety demonstration in fermented food products. Update of the IDF Bulletin 455/2012

Bourdichon, F., Alper, I., Bibiloni, R., Dubois, A., Laulund, S., Miks, M., Morelli, L., Zuliani, V., Yao, S., 2018.

Since 2002, the International Dairy Federation (IDF), in collaboration with the European Food and Feed Cultures Association, has been conducting a project on demonstration of the safety of microbial food cultures.
Following the publication of Bulletin of the IDF 377-2002 in 2012 a joint Action Team of the Standing Committee on Microbiological Hygiene (SCMH) and the Standing Committee on Nutrition and Health (SCNH) published a scientific rationale for the inventory of microbial food cultures demonstrated as safe for use in food product(s).
In 2017/2018, a new joint Action Team of the Standing Committee on Microbiological Hygiene (SCMH) and Standing Committee on Dairy Science and Technology (SCSDT) reviewed the 2012 published rationale and available taxonomic developments in the course of updating the inventory of microbial food cultures. Simultaneously, a questionnaire was sent to all National Committee members of the IDF for submission of new species based on the published scientific rationale.
The current IDF Bulletin provides an updated inventory that replaces the one published in 2012, the Bulletin of the IDF N° 455/ 2012: Safety Demonstration of Microbial Food Cultures in Fermented Food Products.

Available at:
https://fil-idf.org/publications/bulletin/bulletin-idf-n-495-2018-inventory-microbial-food-cultures-safety-demonstration-fermented-food-products/

495
2018

Bulletin

of the International Dairy Federation

Inventory of microbial food cultures with safety demonstration in fermented food products

Update of the Bulletin of the IDF N°455-2012

Fédération Internationale du Lait
FIL IDF
International Dairy Federation

Inventory of microbial food cultures with safety demonstration in fermented food products

Update of the Bulletin of the IDF N°455-2012

INVENTORY OF MICROBIAL FOOD CULTURES WITH SAFETY DEMONSTRATION IN FERMENTED FOOD PRODUCTS

Update of the Bulletin of the IDF N°455-2012

ABSTRACT

Since 2002, the International Dairy Federation (IDF), in collaboration with the European Food and Feed Cultures Association, has been conducting a project on demonstration of the safety of microbial food cultures.

Following the publication of Bulletin of the IDF 377-2002 in 2012 a joint Action Team of the Standing Committee on Microbiological Hygiene (SCMH) and the Standing Committee on Nutrition and Health (SCNH) published a scientific rationale for the inventory of microbial food cultures demonstrated as safe for use in food product(s).

In 2017/2018, a new joint Action Team of the Standing Committee on Microbiological Hygiene (SCMH) and Standing Committee on Dairy Science and Technology (SCSDT) reviewed the 2012 published rationale and available taxonomic developments in the course of updating the inventory of microbial food cultures. Simultaneously, a questionnaire was sent to all National Committee members of the International Dairy Federation (IDF) for submission of new species based on the published scientific rationale.

The current IDF Bulletin provides an updated inventory that replaces the one published in 2012.

Keywords: *Food microbiology, Fermentation, History of use, Microbial Food Cultures, Lactic acid bacteria, Fungi, taxonomy*

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INVENTORY OF MICROBIAL FOOD CULTURES WITH SAFETY DEMONSTRATION IN FERMENTED FOOD PRODUCTS

Update of the Bulletin of the IDF N°455-2012

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FOREWORD

In the Bulletin of the IDF n°455-2012, the authors were aware of the need to perform an update on a regular basis:

"Updating the inventory of microbial species used in fermented food products can be considered as a never-ending task. The exclusion of a microbial species from the published inventory shall be considered in cases of new evidence of potential risks, e.g. opportunistic infections or toxin production. (…) An update is already foreseen in the near future. IDF will therefore dedicate a specific Action Team (AT) to work on continuous updating of the recently published updated inventory, based on thorough evaluation of emerging scientific evidence."

Therefore, the IDF Task Force (TF) was disbanded and converted into an AT to monitor the scientific developments and need for inventory update. The five intervening years since the original publication were noted by the limited requests for updates and absence of safety concerns that should result in a push for inclusion or removal of species. However, during the business meetings of the IDF World Dairy Summit in Rotterdam (NL) in September 2016, it was decided to move forward with a revision of the inventory. The IDF new work was approved in March 2017, and a joint AT of the Standing Committee on Microbiological Hygiene (SCMH) and the Standing Committee on Dairy Science and Technology (SCDST) was created:

François Bourdichon (FR) – Action Team leader, Iraz Alper (FR), Rodrigo Bibiloni (DK), Elna Buys (ZA), Aurélie Dubois (IDF), James Harnett (NZ), Riwanon Lemee-Michel (FR), Adriana Lobacz (PO), Harri Mäkivuokko (FI), Marta Miks (PO), Photis Papademas (CY), Yao Su (CN), Annabelle Zgoda (FR), Véronique Zuliani (FR), Lorenzo Morelli (IT).

The present inventory has been consolidated and finalized with comments received from SCMH, SCDST and IDF National Committees.

All contributors are acknowledged for their participation in this extensive work which was completed in due time. This AT will remain active in order to monitor developments and decide initiation of a future update based on number of species received for inclusion and/or major taxonomical changes.

Brussels, December 2018

Caroline Emond
Director General
International Dairy Federation

ACKNOWLEDGMENTS

The Action Team members would like to thank the National Committees for their support on this project and for the numerous suggestions regarding the incorporation of new species, as well as the scientific team of China Center of Industrial Culture Collection for reviewing the taxonomic status of previous inventory and all new proposed species.

The IDF Head Office is particularly acknowledged for its practical support of the project.

INVENTORY OF MICROBIAL FOOD CULTURES WITH SAFETY DEMONSTRATION IN FERMENTED FOOD PRODUCTS

Update of the Bulletin of the IDF N°455-2012

F. Bourdichon[1], I. Alper[2], R. Bibiloni[3], A. Dubois[4], S. Laulund[5], M. Miks[6], L. Morelli[7], V. Zuliani[8], S. Yao[9]*

1.1. From 2002 to 2012 – Building a rationale for evaluation of Microbial Food Cultures used in fermented foods:

In 2002, the International Dairy Federation (IDF) published jointly with the European Food and Feed Cultures Association (EFFCA) Bulletin of IDF 377-2002, proposing a rationale for the demonstrated safe use of microbial food cultures (MFCs) and an inventory of species based upon this rationale (Mogensen et al., 2002a & 2002b).

Along with a national initiative from Denmark, this inventory remained the only reference of species / strains with a history of safe use for almost a decade. The approach, however, needed to be reviewed in light of taxonomic classification updates and additional evidence of the role of MFCs in fermentation processes.

In 2012, a joint Action Team of the IDF Standing Committees on Nutrition and Health (SCNH) and on Microbiological Hygiene (SCMH) published a proposed rationale for evaluation of species with a history of safe use in fermented food products (Bourdichon et al., 2012a). Thus, Bulletin of IDF 377-2002 was revised in 2012, and published as Bulletin of the IDF 455-2012 (Bourdichon et al., 2012b; Bourdichon et al., 2012c; Bourdichon et al., 2012d). Arising from this updated IDF/EFFCA approach, the objective of the joint Action Team was to publish an updated list of MFCs used in fermented foods based on currently available scientific evidence and knowledge.

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5. EFFCA - European Food & Feed Cultures Association, Avenue de Tervueren 188A postbox 4, 1150 Brussels, BELGIUM & Chr Hansen A/S, Boge Alle 10-12, DK-2970 Horsholm, Denmark.
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9. CNRIFFI, China National Research Institute of Food and Fermentation Industries, CICC, Jiuxian bridge middle Road 24-6, BEIJING, China.

1.2. 2004 – 2008: EFSA safety assessment of strains voluntarily added in the food chain:

In Europe, at strain level, the qualified presumption of safety (QPS) has been proposed by the European Food Safety Authority (EFSA) – Biohazard panel (BIOHAZ) for their internal use for safety evaluation.

QPS assessment was developed internally by the Biohazard Panel as a harmonised generic pre-assessment to support safety risk assessments performed by EFSA scientific panels (EFSA, 2007). It was introduced initially for harmonising the assessment of notified biological agents across EFSA's Scientific Panels and Units.

Considering the expanding evidence of microorganisms in use in the food chain, EFSA identified a potential safety risk (i.e. while some organisms have a long history of apparent safe use, others are less well understood and could potentially represent a risk for consumers).

Based on the recommendation of the European Commission in 2002 to establish the QPS Assessment framework, it was determined that a safety assessment of a defined taxonomic group (e.g. genus or group of related species) could be made independently of any particular pre-market authorisation process. Thus, QPS status could be granted to a taxonomic group that did not raise safety concerns or where existing safety concerns could be defined and excluded by qualification. Thereafter, any strain of microorganism the identity of which could be unambiguously established and assigned to a QPS group would be freed from the need for further safety assessment other than satisfying any qualifications specified. Those strains failing to satisfy a qualification would be considered hazardous and, in the absence of mitigating circumstances, unfit for purpose. Microorganisms not considered suitable for QPS would remain subject to a full safety assessment. QPS as a concept provides a generic assessment for use internally within EFSA for all requests received for the safety assessments of microorganisms deliberately introduced into the food chain.

Even though it is by design a strain level safety demonstration, a list of QPS species is built from the panel. The list of QPS species *per se* is not exhaustive; it is based on the species of the strains submitted for evaluation.

1.3. A Species – Food Matrix approach vs. a Strain approach:

The updated IDF / EFFCA approach (Bourdichon et al., 2012a) was published after three subsequent QPS updates from EFSA (EFSA 2009, 2010, 2011).

It was an objective of the Joint Action Team SCMH-SCNH to avoid any confusion between the IDF / EFFCA and the BIOHAZ QPS approaches. This was also understood by EFSA BIOHAZ in the 2012 QPS Update (EFSA, 2012): "The body of knowledge concerning a defined taxonomic unit is assessed to conclude whether it is sufficient to reach a decision regarding its safety. The body of knowledge includes the history of use of a taxonomic unit, scientific literature, clinical aspects, industrial applications, ecology and other factors as considered appropriate. An inventory of microbial food cultures with a technological role in fermented food was published by the International Dairy Federation (Bourdichon et al., 2012a). In this opinion, only scientific information was considered which can be cited in a transparent manner and includes sufficient description of the methodologies and the results obtained."

While both approaches do have an inventory of species as major outcomes, the comparison is of low relevance, if any. One should consider the two approaches as complementary, which is a way to close a gap after the 2005 EFSA QPS Colloquium where it was decided to exclude traditional fermented foods from the approach.

1.4. Updating the Inventory of Microbial Food Cultures with History of Safe Use from Bulletin of the IDF n°455-2012:

In Bulletin of IDF 455-2012, the authors were aware of the need to perform an update on a regular basis (even if overly optimistic on the frequency):

"Updating the inventory of microbial species used in fermented food products can be considered as a never-ending task. The exclusion of a microbial species from the published inventory shall be considered in cases of new evidence for potential risks, e.g. opportunistic infections or toxin production. (…) An update is already foreseen in the near future. IDF will therefore dedicate a specific action team to work on continuous updating of the recently published up-to-date inventory, based on thorough evaluation of any new scientific evidence that is provided. (…) An updated publication of the proposed inventory of microbial species with history of use in fermented foods will be considered every two years and be made available on the IDF website."

During the five years following the publication of the inventory, there were limited requests for updates and there was an absence of safety concerns to push for an inclusion or removal of species. However, during the business meetings of the World Dairy Summit in Rotterdam, fall 2016, it was decided to move forward with a revision of the inventory by a joint Action Team (AT) of the SCMH and the SCDST. The AT members reviewed the taxonomy of existing species and conducted investigations of the literature for any new topics of concerns. Based on the available evidence, it was decided to maintain the rationale of safety demonstration as initially published (Bourdichon et al., 2012a).

In early 2017, a questionnaire for submission of new species was sent to all IDF National Committees (NC). Questionnaires and species submissions were received during 2017 and a list was prepared. The list was reviewed during the business meetings of the World Dairy Summit in Belfast in October 2017. Some additional species were submitted in early 2018.

Inventory	2002	2012	2018
Bacteria	83	195	226
Fungi	30	69	95

1.5. Limitations of the present inventory:

While the IDF action team aimed to produce an exhaustive inventory in relation to dairy fermented products, they are open to all types of fermented foods, which represent an estimated 30% of daily food intake (Campbell-Platt).

Due to the prevalence of species in different fermented foods, one can expect a species to be associated with different food purposes. Therefore, for any given species included in the inventory, more than one reference may be found. The present 2018 update only considers new species and revises the taxonomy. The extension of food purposes was not considered. This will be the focus of the next update as certain “dairy” species can be used in other food matrices (but presumably not all) and conversely.

The present initiative from IDF /EFFCA is a recommendation built on a particular scientific rationale. It does not replace regulations in place when applicable (Herody et al., 2010; Laulund et al., 2017).

1.6. References:

- Bourdichon, F., Casaregola, S., Farrokh, C., Frisvad, J.C., Gerds, M.L., Hammes, W.P., Harnett, J., Huys, G., Laulund, S., Ouwehand, A., Powell, I.B., Prajapati, J.B., Seto, Y., Ter Schure, E., Van Boven, A., Vankerckhoven, V., Zgoda, A., Tuijtelaars, S., Hansen, E.B., 2012a. Food fermentations: microorganisms with technological beneficial use. Int J Food Microbiol 154(3) 87-97.

- Bourdichon, F., Berger, B., Casaregola, S., Farrokh, C., Frisvad, J.C., Gerds, M.L., Hammes, W.P., Harnett, J., Huys, G., Kleerebezem, M., Laulund, S., Ouwehand, A., Powell, I.B., Prajapati, J.B., Seto, Y., Ter Schure, E., Van Boven, A., Vankerckhoven, V., Zgoda, A., Bech Hansen, E., 2012b
  A Safety Assessment of Microbial Food Cultures with History of Use in Fermented Dairy Products
  Bulletin of IDF 455, 2-12.

- Bourdichon, F., Berger, B., Casaregola, S., Farrokh, C., Frisvad, J.C., Gerds, M.L., Hammes, W.P., Harnett, J., Huys, G., Laulund, S., Ouwehand, A., Powell, I.B., Prajapati, J.B., Seto, Y., Ter Schure, E., Van Boven, A., Vankerckhoven, V., Zgoda, A., Bech Hansen, E., 2012c. Building an Inventory of Microbial Food Cultures with a Technological Role in Fermented Food Products. Bulletin of IDF 455, 13-21.

- Bourdichon, F., Boyaval, P., Casaregola, S., Dupont, J., Farrokh, C., Frisvad, J.C., Hammes, W.P., Huys, G., Jany, J.L., Laulund, S., Ouwehand, A., Seto, Y., Zgoda, A., Bech Hansen, E., 2012d. The 2012 Inventory of Microbial Species with Technological Beneficial Role in Fermented Food Products. Bulletin of IDF 455, 22-61.

- Campbell-Platt, G., 1994. Fermented foods — a world perspective. Food Res. Int. 27, 3, 253-257

- EFSA Panel on Biological Hazards (BIOHAZ); Scientific Opinion of the Panel on Biological Hazards on a request from EFSA on the maintenance of the QPS list of microorganisms intentionally added to food or feed. The EFSA Journal (2008) 923, 1-48

- EFSA Panel on Biological Hazards (BIOHAZ); Scientific Opinion on the maintenance of the list of QPS microorganisms intentionally added to food or feed (2009 update). EFSA Journal 2009; 7(12)1431

- EFSA Panel on Biological Hazards (BIOHAZ); Scientific Opinion on the maintenance of the list of QPS biological agents intentionally added to food and feed (2010 update. EFSA Journal 2010;8(12):1944

- EFSA Panel on Biological Hazards (BIOHAZ); Scientific Opinion on the maintenance of the list of QPS

- biological agents intentionally added to food and feed (2011 update). EFSA Journal 2011;9(12):2497

- EFSA Panel on Biological Hazards (BIOHAZ); Scientific Opinion on the maintenance of the list of QPS biological agents intentionally added to food and feed (2012 update). EFSA Journal 2012;10(12):3020

- EFSA Scientific Committee, 2007. Opinion of the Scientific Committee on a request from EFSA on the introduction of a Qualified Presumption of Safety (QPS) approach for assessment of selected microorganisms referred to EFSA. The EFSA Journal (2007) 587, 1-16

- Herody, C., Soyeux, Y., Bech Hansen, E., Gillies, K., 2010. The legal status of microbial food cultures in the European Union: an overview. European Food and Feed Law Review 5 (2010), 258–269.

- Laulund, S., Wind, A., Derkx, P. M. F., Zuliani, V., 2017. Regulatory and Safety Requirements for Food Cultures. Microorganisms 5, 28, 1-14.

- Mogensen, G., Salminen, S., O'Brien, J., Ouwehand, A., Holzapfel, W., Shortt, C., Fonden, R., Miller, G.D., Donohue, D., Playne, M., Crittenden, R., Salvadori, B., Zink, R., 2002a. Food microorganisms - health benefits, safety evaluation and strains with documented history of use in foods. Bulletin of IDF 377, 4-9.

- Mogensen, G., Salminen, S., O'Brien, J., Ouwehand, A., Holzapfel, W., Shortt, C., Fonden, R., Miller, G.D., Donohue, D., Playne, M., Crittenden, R., Salvadori, B., Zink, R., 2002b. Inventory of microorganisms with a documented history of use in food. Bulletin of IDF 377, 10-19.

1.7. Annex 1: Definitions

The definitions used in the present Bulletin are based upon the one defined is the previous 2012 publications (Bourdichon et al., 2012a, 2012b)

Microbial Food Cultures (MFCs):
"Microbial food cultures are live bacteria, yeasts or molds used in food production".
MFC preparations are formulations, consisting of one or more microbial species and/or strains, including media components carried over from fermentation in addition to components which are necessary for their survival, storage, standardization, and to facilitate their application in the food production process.

Fermentation:
Fermentation of foods occurs in approximately one-third of the world food production. While fermented foods per se have been part of the human diet since approximately 10 000 B.C., it is only since the emergence of Food Microbiology (i.e. after Pasteur's scientific advances) that we are aware of the major impact of microbial food cultures in our diet.
Around 1877, the role of a sole bacterium, *Bacterium lactis* (*Lactococcus lactis*), in fermented milk was shown by Sir John Lister.
Louis Pasteur defined fermentation, from the Latin word fervere, as "La vie sans l'air" (life without air).

Fermentation plays many different roles in food processing. Major roles include:

- Preservation of food through formation of inhibitory metabolites such as organic acid (lactic acid, acetic acid, formic acid, propionic acid), ethanol and bacteriocins, often in combination with decreased water activity (by drying or use of salt).
- Improving food safety through inhibition of pathogens or removal of toxic compounds
- Improving the nutritional value and organoleptic quality of the food

Microbial Species:
Taxonomy and systematics constitute the basis for the regulatory frameworks for MFCs. Yet the definition of a microbial species as a taxonomic unit is still not widely adopted. In the third edition of Prokaryotes, a prokaryotic species is defined by:

- a phylogenetic component given as "the smallest diagnosable cluster of individual organisms within which there is a parental pattern of ancestry and descendants"

  and

- a taxonomic component given as "a group of related organisms that is distinguished from similar groups by a constellation of significant genotypic, phenotypic, and ecological characteristics."

A bacterial species is represented by a type strain with individual strains showing a high degree of phenotypic and/or genotypic similarity to the type strain regarded as belonging to the same species. Whilst objective measures of relatedness have been proposed (such as percentage genome hybridization or sequence similarity), there is no simple definition of the species as a taxonomical unit.

Microbial Strain:

The strain is the most stringent classification cluster recognized. Traditionally based upon isolation of culture colonies and phenotypic observation, it is now classically based on the global sequence of the genome.

Considering the variation of genome sequences during replication, it is not yet clearly defined how strains should be differentiated, and phenotypic characteristics and epidemiological data are still considered to provide information for inclusion or not of different isolates to the same strain.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Monera	Proteobacteria	Acetobacteraceae	Acetobacter	Acetobacter aceti	Acetobacter aceti subsp. aceti	Vinegar
Monera	Proteobacteria	Acetobacteraceae	Acetobacter	Acetobacter fabarum		Cocoa, Coffee
Monera	Proteobacteria	Acetobacteraceae	Acetobacter	Acetobacter intermedius		Kombucha
Monera	Proteobacteria	Acetobacteraceae	Acetobacter	Acetobacter lovaniensis		Vegetables
Monera	Proteobacteria	Acetobacteraceae	Acetobacter	Acetobacter malorum		Vinegar
Monera	Proteobacteria	Acetobacteraceae	Acetobacter	Acetobacter nitrogenifigens		Kombucha
Monera	Proteobacteria	Acetobacteraceae	Acetobacter	Acetobacter orientalis		Vegetables
Monera	Proteobacteria	Acetobacteraceae	Acetobacter	Acetobacter orleanensis		Vinegar
Monera	Proteobacteria	Acetobacteraceae	Acetobacter	Acetobacter pasteurianus	Acetobacter pasteurianus subsp. pasteurianus	Vinegar, Cocoa
Monera	Proteobacteria	Acetobacteraceae	Acetobacter	Acetobacter pomorum		Vinegar
Monera	Proteobacteria	Acetobacteraceae	Acetobacter	Acetobacter syzygii		Vinegar, Cocoa
Monera	Proteobacteria	Acetobacteraceae	Acetobacter	Acetobacter tropicalis		Cocoa, Coffee
Monera	Proteobacteria	Acetobacteraceae	Acetobacter	Acetobacter xylinus		Kombucha
Monera	Actinobacteria	Microbacteriaceae	Agrococcus	Agrococcus casei		Dairy

	Reference Food Usage	Type Strain	Reference Taxonomy
	Beppu, T., 1993-1994. Genetic organization of Acetobacter for acetic acid fermentation. Antonie Van Leeuwenhoek. 64, 121-35.	ATCC 15973	De Ley, J., Frateur, J., 1974. Genus Acetobacter. In: Buchanan, R.E., Gibbons, N.E. (Eds.), Bergey's Manual of Determinative Bacteriology, 8th ed. Williams and Wilkins. Baltimore, MD. 276–278.
	Cleenwerck, I., 2008. Acetobacter fabarum sp. nov., an acetic acid bacterium from a Ghanaian cocoa bean heap fermentation. Int J Syst Evol Microbiol. 58(Pt 9), 2180-5.	DSM 19596	Cleenwerck, I., 2008. Acetobacter fabarum sp. nov., an acetic acid bacterium from a Ghanaian cocoa bean heap fermentation.Int J Syst Evol Microbiol. 58(Pt 9), 2180-5.
	Jayabalan, R., Malbasa, R.V., Loncar, E.S., Vitas, J.S., and Sathishkumar, M., 2014. A Review on Kombucha Tea—Microbiology, Composition, Fermentation, Beneficial Effects, Toxicity, and Tea Fungus. Comprehensive Reviews in Food Science and Food Safety Vol. 13	DSM 11804	BOESCH (C.), TRCEK (J.), SIEVERS (M.) and TEUBER (M.): Acetobacter intermedius sp. nov. Syst. Appl. Microbiol., 1998, 21, 220-229.
	Ongol, M.P., Asano, K., 2009. Main microorganisms involved in the fermentation of Ugandan ghee. Int J Food Microbiol. 133, 286-91.	IFO 16606	Lisdiyanti, P., 2000. Systematic study of the genus Acetobacter with descriptions of Acetobacter indonesiensis sp. nov., Acetobacter tropicalis sp. nov., Acetobacter orleanensis (Henneberg 1906) comb. nov., Acetobacter lovaniensis (Frateur 1950) comb. nov., and Acetobacter estunensis (Carr 1958) comb. nov. J Gen Appl Microbiol. 46, 147-165.
	Gullo, M., 2008. Acetic acid bacteria in traditional balsamic vinegar: phenotypic traits relevant for starter cultures selection. Int J Food Microbiol. 125, 46-53.	DSM 14337	Cleenwerck, I., 2002. Re-examination of the genus Acetobacter, with descriptions of Acetobacter cerevisiae sp. nov. and Acetobacter malorum sp. nov. Int J Syst Evol Microbiol. 52(Pt 5), 1551-8.
	Jayabalan, R., Malbasa, R.V., Loncar, E.S., Vitas, J.S., and Sathishkumar, M., 2014. A Review on Kombucha Tea—Microbiology, Composition, Fermentation, Beneficial Effects, Toxicity, and Tea Fungus. Comprehensive Reviews in Food Science and Food Safety Vol. 13	LMG 23498	DUTTA (D.) and GACHHUI (R.): Novel nitrogen-fixing Acetobacter nitrogenifigens sp. nov., isolated from Kombucha tea. Int. J. Syst. Evol. Microbiol., 2006, 56, 1899-1903.
	Ongol, M.P., Asano, K., 2009. Main microorganisms involved in the fermentation of Ugandan ghee. Int J Food Microbiol. 133, 286-91.	ATCC 12875	Lisdiyanti, P., 2001. Identification of Acetobacter strains isolated from Indonesian sources, and proposals of Acetobacter syzygii sp. nov., Acetobacter cibinongensis sp. nov., and Acetobacter orientalis sp. nov. J Gen Appl Microbiol. 47, 119-131.
	Mamlouk D, Hidalgo C, Torija MJ, et al. Evaluation and optimisation of bacterial genomic DNA extraction for no-culture techniques applied to vinegars[J].Food Microbiol, 2011, 28(7):1374-1379.	ATCC 12876	Lisdiyanti, P., Kawasaki, H., Seki, T., Yamada, Y., Uchimura, T., & Komagata, K. (2000). Systematic study of the genus acetobacter with descriptions of acetobacter indonesiensis sp. nov. acetobacter tropicalis sp. nov. acetobacter orleanensis (henneberg 1906) comb. nov. acetobacter lovaniensis (frateur 1950) comb. nov. and acetobacter estu. Journal of General & Applied Microbiology, 46(3), 147-165.
	Nanda, K., Taniguchi, M., Ujike, S., Ishihara, N., Mori, H., Ono, H., Murooka, Y., 2001. Characterization of acetic acid bacteria in traditional acetic acid fermentation of rice vinegar (komesu) and unpolished rice vinegar (kurosu) produced in Japan. Appl Environ Microbiol. 67, 986-90.	ATCC 12874	De Ley, J., Frateur, J., 1974. Genus Acetobacter. In: Buchanan, R.E., Gibbons, N.E. (Eds.), Bergey's Manual of Determinative Bacteriology, 8th ed. Williams and Wilkins. Baltimore, MD. 276–278.
	Sokollek, S.J., Hertel, C., Hammes, W.P., 1998. Description of Acetobacter oboediens sp. nov. and Acetobacter pomorum sp. nov., two new species isolated from industrial vinegar fermentations. Int. J. Syst. Bacteriol. 48, 935–940.	DSM 11825	Sokollek, S.J., Hertel, C., Hammes, W.P., 1998b. Description of Acetobacter oboediens sp. nov. and Acetobacter pomorum sp. nov., two new species isolated from industrial vinegar fermentations. Int. J. Syst. Bacteriol. 48, 935–940.
	Nielsen, D.S., 2007. The microbiology of Ghanaian cocoa fermentations analysed using culture-dependent and culture-independent methods.Int J Food Microbiol. 114, 168-86.	IFO 16604	Lisdiyanti, P., 2001. Identification of Acetobacter strains isolated from Indonesian sources, and proposals of Acetobacter syzygii sp. nov., Acetobacter cibinongensis sp. nov., and Acetobacter orientalis sp. nov. J Gen Appl Microbiol. 47, 119-131.
	Nielsen, D.S., 2007. The microbiology of Ghanaian cocoa fermentations analysed using culture-dependent and culture-independent methods.Int J Food Microbiol. 114, 168-86.	IFO 16470	"Lisdiyanti, P., 2000. Systematic study of the genus Acetobacter with descriptions of Acetobacter indonesiensis sp. nov., Acetobacter tropicalis sp. nov., Acetobacter orleanensis (Henneberg 1906) comb. nov., Acetobacter lovaniensis (Frateur 1950) comb. nov., and Acetobacter estunensis (Carr 1958) comb. nov. J Gen Appl Microbiol. 46, 147-165."
	Jayabalan, R., Malbasa, R.V., Loncar, E.S., Vitas, J.S., and Sathishkumar, M., 2014. A Review on Kombucha Tea—Microbiology, Composition, Fermentation, Beneficial Effects, Toxicity, and Tea Fungus. Comprehensive Reviews in Food Science and Food Safety Vol. 13	DSM 6513	YAMADA (Y.): Acetobacter xylinus sp. nov., nom. rev., for the cellulose-forming and cellulose-less, acetate-oxidizing acetic acid bacteria with the Q-10 system. J. Gen. Appl. Microbiol., 1983, 29, 417-420.
	Roth E, Miescher Schwenninger S, Hasler M, Eugster-Meier E, Lacroix C. 2010. Population dynamics of two antilisterial cheese surface consortia revealed by temporaltemperature gradient gel electrophoresis. BMC Microbiol. 10,74.	DSM18061	Bora N, Vancanneyt M, Gelsomino R, Swings J, Brennan N, Cogan TM, Larpin S, Desmasures N, Lechner FE, Kroppenstedt RM, Ward AC, Goodfellow M. 2007. Agrococcus casei sp. nov., isolated from the surfaces of smear-ripened cheeses. Int J Syst Evol Microbiol. 57, 92-97.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Monera	Actinobacteria	Micrococcaceae	Arthrobacter	Arthrobacter aurescens		Dairy
Monera	Actinobacteria	Micrococcaceae	Arthrobacter	Arthrobacter crystallopoietes		Dairy
Monera	Actinobacteria	Micrococcaceae	Arthrobacter	Arthrobacter globiformis		Dairy
Monera	Actinobacteria	Micrococcaceae	Arthrobacter	Arthrobacter ilicis		Dairy
Monera	Actinobacteria	Micrococcaceae	Arthrobacter	Arthrobacter protophormiae		Dairy
Monera	Firmicutes	Bacillaceae	Bacillus	Bacillus amyloliquefaciens		Fish
Monera	Firmicutes	Bacillaceae	Bacillus	Bacillus coagulans		Cocoa
Monera	Firmicutes	Bacillaceae	Bacillus	Bacillus subtilis		Soy
Monera	Proteobacteria	Bdellovibrionaceae	Bdellovibrio	Bdellovibrio bacteriovorus		Various, a.o. mushrooms
Monera	Actinobacteria	Bifidobacteriaceae	Bifidobacterium	Bifidobacterium adolescentis		Dairy
Monera	Actinobacteria	Bifidobacteriaceae	Bifidobacterium	Bifidobacterium animalis	Bifidobacterium animalis subsp animalis	Dairy
Monera	Actinobacteria	Bifidobacteriaceae	Bifidobacterium	Bifidobacterium animalis	Bifidobacterium animalis subsp lactis	Dairy, beer, vegetable juice, fruit juice
Monera	Actinobacteria	Bifidobacteriaceae	Bifidobacterium	Bifidobacterium bifidum		Dairy
Monera	Actinobacteria	Bifidobacteriaceae	Bifidobacterium	Bifidobacterium breve		Dairy, Soy
Monera	Actinobacteria	Bifidobacteriaceae	Bifidobacterium	Bifidobacterium longum	Bifidobacterium longum subsp. Infantis	Dairy

	Reference Food Usage	Type Strain	Reference Taxonomy
	Carnio, M.C., Eppert, I., Scherer, S., 1999. Analysis of the bacterial surface ripening flora of German and French smeared cheeses with respect to their anti-listerial potential International Journal of Food Microbiology 47 89–97	ATCC 13344	PHILLIPS (H.C.): Characterizatiion of the soil globiforme bacteria. Iowa State Journal of Science, 1953, 27, 240-241
	Carnio, M.C., Eppert, I., Scherer, S., 1999. Analysis of the bacterial surface ripening flora of German and French smeared cheeses with respect to their anti-listerial potential International Journal of Food Microbiology 47 89–97	ATCC 15481	ENSIGN (J.C.) and RITTENBERG (S.C.): A crystalline pigment produced from 2-hydroxypyridine by Arthrobacter crystallopoietes n. sp. Archiv für Mikrobiologie, 1963, 47, 137-153.
	Fox, P.F., 2000. Fundamentals of cheese science. Springer.	ATCC 8010	Conn, H.J., 1928. A type of bacteria abundant in productive soils, but apparently lacking in certain soils of low productivity. New York State Agricultural Experimental Station Technical Bulletin No. 138:3–26.
	Carnio, M.C., Eppert, I., Scherer, S., 1999. Analysis of the bacterial surface ripening flora of German and French smeared cheeses with respect to their anti-listerial potential International Journal of Food Microbiology 47 89–97	ATCC 14264	COLLINS (M.D.), JONES (D.) and KROPPENSTEDT (R.M.): Reclassification of Corynebacterium ilicis (Mandel, Guba and Litsky) in the genus Arthrobacter as Arthrobacter ilicis comb. nov. Zentralbl. Bakteriol. Parasitenkd. Infektionskr. Hyg. Abt. 1 Orig., 1981, C2, 318-323.
	Carnio, M.C., Eppert, I., Scherer, S., 1999. Analysis of the bacterial surface ripening flora of German and French smeared cheeses with respect to their anti-listerial potential International Journal of Food Microbiology 47 89–97	ATCC 19271	STACKEBRANDT (E.), FOWLER (V.J.), FIEDLER (F.) and SEILER (H.): Taxonomic studies on Arthrobacter nicotianae and related taxa: description of Arthrobacter uratoxydans sp. nov. and Arthrobacter sulfureus sp. nov. and reclassification of Brevibacterium protophormiae as Arthrobacter protophormiae comb. nov. Syst. Appl. Microbiol., 1983, 4, 470-486.
	Zaman MZ, 2011. Novel starter cultures to inhibit biogenic amines accumulation during fish sauce fermentation. Int J Food Microbiol 145(1):84-91.	ATCC 23350	Priest, F.G., Goodfellow, M., Shute, L.A., Berkeley, R.C.W., 1987. Bacillus amyloliquefaciens sp. nov., nom. Rev. Int J Syst Bacteriol 37, 69-71
	Schwan, R.F., Vanetti, M.C.D., Silva, D.O., Lopez, A., de Moraes, C.A., 1986. Characterization and distribution of aerobic, spore-forming bacteria from cacao fermentations in Bahia. J. Food Sci. 51:1583–1584.	ATCC 7050	HAMMER, B.W., 1915. Bacteriological studies on the coagulation of evaporated milk. Iowa Agr. Expt. Sta., Res. Bull. 19.
	Nagami, Y., Tanaka, T., 1986. Molecular cloning and nucleotide sequence of a DNA fragment from Bacillus natto that enhances production of extracellular proteases and levansucrase in Bacillus subtilis. J Bacteriol. 166, 20-8. Wang, J., Fung, D.Y., 1996. Alkaline-fermented foods: a review with emphasis on pidan fermentation. Crit Rev Microbiol. 22, 101-38.	ATCC 6051	Gibson, T., Gordon, R., 1974. Endospore-forming rods and cocci. Family I. Bacillacea, genus I. Bacillus Cohn, p. 529-550. In: Buchanan, R.E., Gibsons, N.E. (Eds.), Bergey's manual of determinative bacteriology, 8th ed. The Williams & Wilkins Co., Baltimore.
	Emma B Saxon, Robert W Jackson, Shobita Bhumbra, Tim Smith and R Elizabeth Sockett. Bdellovibrio bacteriovorus HD100 guards against Pseudomonas tolaasii brown-blotch lesions on the surface of post-harvest Agaricus bisporus supermarket mushrooms. BMC Microbiology201414:163, DOI: 10.1186/1471-2180-14-163	DSM-50701	Int. J. Syst. Bacteriol. 30:262 (AL)
	Rabiu, B.A., 2001. Synthesis and fermentation properties of novel galacto-oligosaccharides by beta-galactosidases from Bifidobacterium species. Appl Environ Microbiol. 67, 2526-30.	ATCC 15703	Reuter, G., 1963. Vergleichende Untersuchunge über die Bifidus-Flora im Säuglings- und Erwachsenenstuhl. Zentralbl. Bakteriol. Parasitenkd. Infektionskr. Hyg. Abt. 1, Orig. Reihe A191 486–507.
	Biavati, B., Mattarelli, P., Crociani, F., 1992. Identification of bifidobacteria from fermented milk products. Microbiologica 15, 7-13.	ATCC 25527	Mitsuoka, T., 1969. Comparative studies on bifidobacteria isolated from the alimentary tract of man and animals. Zentralbl. Bakteriol. Parasitenkd. Infektionskr. Hyg. Abt. 1, Orig. Reihe A210 52–64.
	Biavati, B., Mattarelli, P., Crociani, F., 1992. Identification of bifidobacteria from fermented milk products. Microbiologica 15, 7-13. Sohrabvandi, S.; Mousavi, S. M.; Razavi, S. H., Shaheed Behesti, 2010. Viability of probiotic bacteria in low alcohol and non-alcoholic beer during refrigerated storage. 93, 104-108. Buruleanu, Claudia; Nicolescu, Carmen; Avram, Daniela; Manea, Iuliana; Bratu, Magda, 2012. Effects of yeast extract and different amino acids on the dynamics of some components in cabbage juice during fermentation with Bifidobacterium lactis BB-12. Food Science & Biotechnology, 21, 691-699. Saarela, Maria; Virkajärvi, Ilkka; Alakomi, Hanna-Leena; Sigvart-Mattila, Pia; Mättö, Jaana, 2006. Stability and functionality of freeze-dried probiotic Bifidobacterium cells during storage in juice and milk. VTT Technical Research Centre of Finland: VTT Publications.	DSM 10140	Meile, L., Ludwig, W., Rueger, U., Gut, C., Kaufmann, P., Dasen, G., Wenger, S., Teuber, M., 1997. Bifidobacterium lactis sp.nov., a moderately oxygen tolerant species isolated from fermented milk. Syst. Appl. Microbiol. 20, 57–64.
	Ventling, B.L., Mistry, V.V., 1993. Growth characteristics of bifidobacteria in ultrafiltered milk. J Dairy Sci. 76, 962-71.	ATCC 29521	Orla-Jensen, S., 1924. La classification des bactéries lactiques. Lait 4, 468–474.
	Scalabrini, P., Rossi, M., Spettoli, P., Matteuzzi, D., 1998. Characterization of Bifidobacterium strains for use in soymilk fermentation. Int J Food Microbiol. 39, 213-9.	ATCC 15700	Reuter, G., 1963. Vergleichende Untersuchunge über die Bifidus-Flora im Säuglings- und Erwachsenenstuhl. Zentralbl. Bakteriol. Parasitenkd. Infektionskr. Hyg. Abt. 1, Orig. Reihe A191 486–507.
	Daigle A, Roy D, Belanger G, Vuilemard JC, 1999. Production of probiotic cheese (cheddar-like cheese) using enriched cream fermented by Bifidobacterium infantis.J Dairy Sci. 82(6):1081-91.	ATCC15697	Reuter G., 1971. Designation of type strains for Bifidobacterium species. Int. J. Syst. Bacteriol. 21, 273-275.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Monera	Actinobacteria	Bifidobacteriaceae	Bifidobacterium	Bifidobacterium pseudolongum	Bifidobacterium pseudolongum subsp. pseudologum	Dairy
Monera	Actinobacteria	Bifidobacteriaceae	Bifidobacterium	Bifidobacterium thermophilum		Dairy
Monera	Actinobacteria	Dermabacteraceae	Brachybacterium	Brachybacterium alimentarium		Dairy
Monera	Actinobacteria	Dermabacteraceae	Brachybacterium	Brachybacterium nesterenkovii		Dairy
Monera	Actinobacteria	Dermabacteraceae	Brachybacterium	Brachybacterium paraconglomeratum		Dairy
Monera	Actinobacteria	Dermabacteraceae	Brachybacterium	Brachybacterium tyrofermentans		Dairy
Monera	Actinobacteria	Brevibacteriaceae	Brevibacterium	Brevibacterium antiquum		Dairy
Monera	Actinobacteria	Brevibacteriaceae	Brevibacterium	Brevibacterium aurantiacum		Dairy
Monera	Actinobacteria	Brevibacteriaceae	Brevibacterium	Brevibacterium casei		Dairy
Monera	Actinobacteria	Brevibacteriaceae	Brevibacterium	Brevibacterium iodinum		Dairy
Monera	Actinobacteria	Brevibacteriaceae	Brevibacterium	Brevibacterium linens		Dairy
Monera	Firmicutes	Carnobacteriaceae	Carnobacterium	Carnobacterium divergens		Dairy, Meat, Fish
Monera	Firmicutes	Carnobacteriaceae	Carnobacterium	Carnobacterium maltaromaticum		Dairy
Monera	Firmicutes	Carnobacteriaceae	Carnobacterium	Carnobacterium mobile		Dairy

	Reference Food Usage	Type Strain	Reference Taxonomy
	Rabiu, B.A., 2001. Synthesis and fermentation properties of novel galacto-oligosaccharides by beta-galactosidases from Bifidobacterium species. Appl Environ Microbiol. 67, 2526-30.	ATCC 25526	Mitsuoka, T., 1969. Comparative studies on bifidobacteria isolated from the alimentary tract of man and animals. Zentralbl. Bakteriol. Parasitenkd. Infektionskr. Hyg. Abt. 1, Orig. Reihe A210, 52–64.
	Xiao, J.Z., 2010. Distribution of in vitro fermentation ability of lacto-N-biose I, a major building block of human milk oligosaccharides, in bifidobacterial strains. Appl Environ Microbiol. 76, 54-9.	ATCC 25525	Mitsuoka, T., 1969. Comparative studies on bifidobacteria isolated from the alimentary tract of man and animals. Zentralbl. Bakteriol. Parasitenkd. Infektionskr. Hyg. Abt. 1, Orig. Reihe A210, 52–64.
	Schubert, K., Ludwig, W., Springer, N., Kroppenstedt, R.M., Accolas, J.P., Fiedler, F., 1996. Two coryneform bacteria isolated from the surface of French Gruyère and Beaufort cheeses of the genus brachybacterium: Brachybacterium alimentarium sp. nov. and Bracybacterium tyrofermentans sp. nov. Int J Syst Bacteriol. 46, 81-7.	ATCC 700067	Schubert, K., Ludwig, W., Springer, N., Kroppenstedt, R.M., Accolas, J.P., Fiedler, F., 1996. Two coryneform bacteria isolated from the surface of French Gruyère and Beaufort cheeses of the genus brachybacterium: Brachybacterium alimentarium sp. nov. and Bracybacterium tyrofermentans sp. nov. Int J Syst Bacteriol. 46, 81-7.
	GVOZDYAK (O.R.), NOGINA (T.M.) and SCHUMANN (P.): Taxonomic study of the genus Brachybacterium: Brachybacterium nesterenkovii sp. nov. Int. J. Syst. Bacteriol., 1992, 42, 74-78.	DSM 9573	GVOZDYAK (O.R.), NOGINA (T.M.) and SCHUMANN (P.): Taxonomic study of the genus Brachybacterium: Brachybacterium nesterenkovii sp. nov. Int. J. Syst. Bacteriol., 1992, 42, 74-78.
	Callon, C; Duthoit, F; Delbes, C; Ferrand, M; Le Frileux, Y; De Cremoux, R; Montel, MC. Stability of microbial communities in goat milk during a lactation year: Molecular approaches. 2007. Syst. Appl. Microbiol. 30,547-560	ATCC51843	Takeuchi M., Fang C.X. and Yokota A. 1995. Taxonomic study of the genus Brachybacterium: proposal of Brachybacterium conglomeratum sp. nov., nom. rev., Brachybacterium paraconglomeratum sp. nov., and Brachybacterium rhamnosum sp. nov. Int. J. Syst. Bacteriol. 45, 160-168.
	Schubert, K., Ludwig, W., Springer, N., Kroppenstedt, R.M., Accolas, J.P., Fiedler, F., 1996. Two coryneform bacteria isolated from the surface of French Gruyère and Beaufort cheeses of the genus brachybacterium: Brachybacterium alimentarium sp. nov. and Bracybacterium tyrofermentans sp. nov. Int J Syst Bacteriol. 46, 81-7.	ATCC 700068	Schubert, K., Ludwig, W., Springer, N., Kroppenstedt, R.M., Accolas, J.P., Fiedler, F., 1996. Two coryneform bacteria isolated from the surface of French Gruyère and Beaufort cheeses of the genus brachybacterium: Brachybacterium alimentarium sp. nov. and Bracybacterium tyrofermentans sp. nov. Int J Syst Bacteriol. 46, 81-7.
	Ozturkoglu Budak, M.J. Figge, J. Houbraken, R.P. de Vries. 2016. The diversity and evolution of microbiota in traditional Turkish Divle Cave cheese during ripening. Int. Dairy J. 58, 50–54	LMG 22206	Gavrish, E. Yu, Krauzova, V.I., Potekhina, N. V., Karasev, S. G., Plotnikova E.G., Altyntseva O.V., Korosteleva, L.A. and Evtushenko L.I. 2004. Three New Species of Brevibacteria, Brevibacterium antiquum sp. nov., Brevibacterium aurantiacum sp. nov., and Brevibacterium permense sp. nov. Microbiology (English translation of Mikrobiologiya) 73,176-183.
	Leclercq-Perlat, M.N., Corrieu, G., Spinnler, H.E., 2007. Controlled production of camembert-type cheeses: part III role of the ripening microflora on free fatty acid concentrations. J Dairy Res. 74, 218-25.	ATCC 9175	Gavrish, E.Yu., Krauzova, V.I., Potekhina, N.V., Karasev, S.G., Plotnikova, E.G., Altyntseva, O.V., Korosteleva, L.A., Evtushenko, L.I., 2004. Three new species of brevibacteria, Brevibacterium antiquum sp. nov., Brevibacterium aurantiacum sp. nov., and Brevibacterium permense sp. nov. Microbiology (English translation of Mikrobiologiya) 73, 176–183.
	Dolci P, Dolci, P., Barmaz, A., Zenato, S., Pramotton, R., Alessandria, V., Cocolin, L., Rantsiou, K., Ambrosoli, R., 2009. Maturing dynamics of surface microflora in Fontina PDO cheese studied by culture-dependent and -independent methods. J Appl Microbiol. 106, 278-87.	ATCC 35513	Collins, M.D.,Farrow, J.A.E., Goodfellow, M., Minnikin, D.E., 1983. Brevibacterium casei sp.nov. and Brevibacterium epidermidis sp.nov. Systematic and Applied Microbiology 4, 388-395.
	International Journal of Food Microbiology 47 (1999) 89–97. Analysis of the bacterial surface ripening flora of German and French smeared cheeses with respect to their anti-listerial potential. Markus C. Carnio, Ilka Eppert, Siegfried Scherer	ATCC 49514	COLLINS (M.D.), JONES (D.), KEDDIE (R.M.) and SNEATH (P.H.A.): Reclassification of Chromobacterium iodinum (Davis) in a redefined genus Brevibacterium (Breed) as Brevibacterium iodinum nom. rev.; comb. nov. J. Gen. Microbiol., 1980, 120, 1-10.
	Albert, J.O., Long, H.F., Hammer, B.W., 1944. Classification of the organisms important in dairy products. IV. Bacterium linens. Iowa State Coll. Agr. Expt. Sta. Bull.,No. 328.	DSM20425	Bousfield, I.J., 1972. A Taxonomic Study of Some Coryneform Bacteria. Journal of General Microbiology 71, 441-455.
	Hammes, W.P., Hertel, C., 2009. "Carnobacterium". In: De Vos, P., Schleifer, K-H., Ludwig, W., Whitman, W.B., Garrity, G., Jones, D., Rainey, F., Krieg, N.R. (Eds.), Bergey's Manual of Systematic Bacteriology, Volume 3, The Firmicutes; p.p. 549 - 557, Springer	ATCC 35677	Collins, M.D., Farrow, J.A.E., Phillips, B.A., Feresu, S., Jones, D., 1987. Classification of Lactobacillus divergens, Lactobacillus piscicola, and some catalase-negative, asporogenous, rod-shaped bacteria from poultry in a new genus, Carnobacterium. Int. J. Syst. Bacteriol. 37, 310-316.
	Afzal, M.I., Jacquet, T., Delaunay, S., Borges, F., Millière, J.B., Revol-Junelles, A.M., Cailliez-Grimal, C., 2010. Carnobacterium maltaromaticum: identification, isolation tools, ecology and technological aspects in dairy products. Food Microbiol. 27, 573-9.	ATCC 27865	Mora, D., Scarpellini, M., Franzetti, L., Colombo, S., Galli, A., 2003. Reclassification of Lactobacillus maltaromicus (Miller et al. 1974) DSM 20342T and DSM 20344 and Carnobacterium piscicola (Collins et al. 1987) DSM 20730T and DSM 20722 as Carnobacterium maltaromaticum comb. nov. Int. J. Syst. Evol. Microbiol. 53, 675-678.
	Retureau E, Callon C, Didienne R, Montel MC. 2010. Is microbial diversity an asset for inhibiting Listeria monocytogenes in raw milk cheeses? Dairy Science & Technology. 90,375-398	ATCC49516	Collins M.D., Farrow J.A.E., Phillips B.A., Feresu S. and Jones D. 1987. Classification of Lactobacillus divergens, Lactobacillus piscicola, and some catalase-negative, asporogenous, rod-shaped bacteria from poultry in a new genus, Carnobacterium. Int. J. Syst. Bacteriol. 37,310-316.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Monera	Actinobacteria	Corynebacteriaceae	Corynebacterium	Corynebacterium ammoniagenes		Dairy
Monera	Actinobacteria	Corynebacteriaceae	Corynebacterium	Corynebacterium casei		Dairy
Monera	Actinobacteria	Corynebacteriaceae	Corynebacterium	Corynebacterium flavescens		Dairy
Monera	Actinobacteria	Corynebacteriaceae	Corynebacterium	Corynebacterium variabile		Dairy
Monera	Firmicutes	Enterococcaceae	Enterococcus	Enterococcus durans		Dairy, Sourdough
Monera	Firmicutes	Enterococcaceae	Enterococcus	Enterococcus faecalis		Dairy, Meat, Soy, Vegetables
Monera	Firmicutes	Enterococcaceae	Enterococcus	Enterococcus faecium		Dairy, Meat, Soy, Vegetables
Monera	Proteobacteria	Acetobacteraceae	Gluconacetobacter	Gluconacetobacter azotocaptans		Cocoa, Coffee
Monera	Proteobacteria	Acetobacteraceae	Gluconacetobacter	Gluconacetobacter diazotrophicus		Cocoa, Coffee
Monera	Proteobacteria	Acetobacteraceae	Gluconacetobacter	Gluconacetobacter entanii		Vinegar
Monera	Proteobacteria	Acetobacteraceae	Gluconacetobacter	Gluconacetobacter johannae		Cocoa, Coffee
Monera	Proteobacteria	Acetobacteraceae	Gluconacetobacter	Gluconacetobacter kombuchae		Kombucha
Monera	Proteobacteria	Acetobacteraceae	Gluconacetobacter	Gluconacetobacter xylinus		Vinegar
Monera	Proteobacteria	Acetobacteraceae	Gluconobacter	Gluconobacter oxydans		Vinegar

	Reference Food Usage	Type Strain	Reference Taxonomy
	Bockelmann, W., Hoppe-Seyler, T., 2001. The surface flora of bacterial smear-ripened cheeses from cow's and goat's milk. International Dairy Journal 11, 307-314.	ATCC 6871	Collins, M.D., 1987 Transfer of Brevibacterium ammoniagenes (Cooke and Keith) to the genus Corynebacterium, as Corynebacterium ammoniagenes comb. nov. Int. J. Syst. Bacteriol. 37, 442–443.
	Bockelmann, W., Willems, K.P., Neve, H., Heller, K.H., 2005. Cultures for the ripening of smear cheeses. International Dairy Journal 15, 719-732.	DSM 44701	Brennan, N.M., Brown, R., Goodfellow, M., Ward, A.C., Beresford, T.P., Simpson, P.J., Fox, P.F., Cogan, T.M., 2001. Corynebacterium mooreparkense sp. nov. and Corynebacterium casei sp. nov., isolated from the surface of a smear-ripened cheese. Int. J. Syst. Evol. Microbiol. 51, 843–852.
	Brennan, N.M., Ward, A.C., Beresford, T.P., Fox, P.F., Goodfellow, M., Cogan, T.M., 2002. Biodiversity of the Bacterial Flora on the Surface of a Smear Cheese Appl. Environ. Microbiol. 68, 820-830.	ATCC 10340	Barksdale, L., Lanéelle, M.A., Pollice, M.C., Asselineau, J., Welby, M., Norgard, M.V., 1979. Biological and chemical basis for the reclassification of Microbacterium flavum Orla-Jensen as Corynebacterium flavescens nom. nov. Int. J. Syst. Bacteriol. 29, 222–233.
	Bockelmann, W., Willems, K.P., Neve, H., Heller, K.H., 2005. Cultures for the ripening of smear cheeses. International Dairy Journal 15, 719-732.	ATCC 15753	Gelsomino, R., Vancanneyt, M., Snauwaert, C., Vandemeulebroecke, K., Hoste, B., Cogan, T.M., Swings, J., 2005. Corynebacterium mooreparkense, a later heterotypic synonym of Corynebacterium variabile. Int. J. Syst. Evol. Microbiol. 55, 1129-1131.
	Miguel Rocha, J., Xavier Malcata, F., 1999. On the Microbiological Profile of Traditional Portuguese Sourdough. Journal of Food Protection 62, 1416–1429. De Angelis, M., 2008. Selection and use of autochthonous multiple strain cultures for the manufacture of high-moisture traditional Mozzarella cheese. International Journal of Food Microbiology 125, 123–132.	ATCC 19432	Sherman, J.M., Wing, H.U., 1937 Streptococcus durans N. Sp. Jour. Dairy Sci. 20, 165-167.
	Foulquie´ Moreno, M.R., Sarantinopoulos, P., Tsakalidou, E., Vuyst, L. De., 2006. The role and application of enterococci in food and health. International Journal of Food Microbiology 106, 1-24.	ATCC 19433	Schleifer, K.H., Kilpper-Balz, R., 1984. Transfer of Streptococcus faecalis and Streptococcus faecium to the genus Enterococcus nom. rev. as Enterococcus faecalis comb. nov. and Enterococcus faecium comb. nov. Int. J. Syst. Bacteriol. 34, 31-34.
	Foulquie´ Moreno, M.R., Sarantinopoulos, P., Tsakalidou, E., Vuyst, L. De., 2006. The role and application of enterococci in food and health. International Journal of Food Microbiology 106, 1-24.	ATCC 19434	Orla-Jensen, S., 1924. La classification des bactéries lactiques. Lait 4, 468–474.
	Fuentes-Ramírez, L.E., Bustillos-Cristales, R., Tapia-Hernandez, A., Jimenez-Salgado, T., Wang, E.T., Martinez-Romero, E., Caballero-Mellado, J., 2001. Novel nitrogen-fixing acetic acid bacteria, Gluconacetobacter johannae sp. nov. and Gluconacetobacter azotocaptans sp. nov., associated with coffee plants. Int. J. Syst. Evol. Microbiol. 51, 1305–1314.	ATCC 700988	Fuentes-Ramírez, L.E., Bustillos-Cristales, R., Tapia-Hernandez, A., Jimenez-Salgado, T., Wang, E.T., Martinez-Romero, E., Caballero-Mellado, J., 2001. Novel nitrogen-fixing acetic acid bacteria, Gluconacetobacter johannae sp. nov. and Gluconacetobacter azotocaptans sp. nov., associated with coffee plants. Int. J. Syst. Evol. Microbiol. 51, 1305–1314.
	Jimenez-Salgado, T., 1997. Coffea arabica L., a new host plant for Acetobacter diazotrophicus, and isolation of other nitrogen-fixing acetobacteria. Appl Environ Microbiol. 63, 3676-83.	ATCC 49037	Yamada, Y., Hoshino, K.-I., Ishikawa, T., 1998. Validation of publication of new names and new combinations previously effectively published outside the IJSB. List No. 64: Gluconacetobacter nom. corrig. (Gluconoacetobacter [sic]). Int. J. Syst. Bacteriol. 48, 327–328.
	Schüller, G., Hertel, C., Hammes, W.P., 2000. Gluconacetobacter entanii sp. nov., a new species isolated from submerged high-acid industrial vinegar fermentations. Int. J. Syst. Evol. Microbiol. 50, 2013–2020.	DSM 13536	Schüller, G., Hertel, C., Hammes, W.P., 2000. Gluconacetobacter entanii sp. nov., a new species isolated from submerged high-acid industrial vinegar fermentations. Int. J. Syst. Evol. Microbiol. 50, 2013–2020.
	Fuentes-Ramírez, L.E., Bustillos-Cristales, R., Tapia-Hernandez, A., Jimenez-Salgado, T., Wang, E.T., Martinez-Romero, E., Caballero-Mellado, J., 2001. Novel nitrogen-fixing acetic acid bacteria, Gluconacetobacter johannae sp. nov. and Gluconacetobacter azotocaptans sp. nov., associated with coffee plants. Int. J. Syst. Evol. Microbiol. 51, 1305–1314.	ATCC 700987	Fuentes-Ramírez, L.E., Bustillos-Cristales, R., Tapia-Hernandez, A., Jimenez-Salgado, T., Wang, E.T., Martinez-Romero, E., Caballero-Mellado, J., 2001. Novel nitrogen-fixing acetic acid bacteria, Gluconacetobacter johannae sp. nov. and Gluconacetobacter azotocaptans sp. nov., associated with coffee plants. Int. J. Syst. Evol. Microbiol. 51, 1305–1314.
	Jayabalan, R., Malbasa, R.V., Loncar, E.S., Vitas, J.S., and Sathishkumar, M., 2014. A Review on Kombucha Tea—Microbiology, Composition, Fermentation, Beneficial Effects, Toxicity, and Tea Fungus. Comprehensive Reviews in Food Science and Food Safety Vol. 13	LMG 23726	DUTTA (D.) and GACHHUI (R.): Nitrogen-fixing and cellulose-producing Gluconacetobacter kombuchae sp. nov., isolated from Kombucha tea. Int. J. Syst. Evol. Microbiol., 2007, 57, 353-357.
	Gullo, M., Caggia, C., De Vero, L., Giudici, P., 2006. Characterization of acetic acid bacteria in ""traditional balsamic vinegar"". Int J Food Microbiol. 106, 209-12.	ATCC 23767	Yamada, Y., Hoshino, K.-I., Ishikawa, T., 1998. Validation of publication of new names and new combinations previously effectively published outside the IJSB. List No. 64: Gluconacetobacter nom. corrig. (Gluconoacetobacter [sic]). Int. J. Syst. Bacteriol. 48, 327–328.
	De Muynck, C., 2007. The genus Gluconobacter oxydans: comprehensive overview of biochemistry and biotechnological applications. Crit Rev Biotechnol. 27(3):147-71.	ATCC 19357	(Henneberg 1897) DeLey, J., 1961. Comparative carbohydrate metabolism and a proposal for the phylogenetic relationship of the acetic acid bacteria. J. Gen. Microbiol. 24:31-50.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Monera	Actinobacteria	Micrococcaceae	Glutamicibacter	Glutamicibacter arilaitensis		Dairy
Monera	Actinobacteria	Micrococcaceae	Glutamicibacter	Glutamicibacter bergerei		Dairy
Monera	Actinobacteria	Micrococcaceae	Glutamicibacter	Glutamicibacter nicotianae		Dairy
Monera	Proteobacteria	Enterobacteriaceae	Hafnia	Hafnia alvei		Dairy
Monera	Proteobacteria	Enterobacteriaceae	Halomonas	Halomonas elongata		Meat
Monera	Actinobacteria	Micrococcaceae	Kocuria	Kocuria rhizophila		Dairy, Meat
Monera	Actinobacteria	Micrococcaceae	Kocuria	Kocuria varians		Dairy, Meat
Monera	Proteobacteria	Acetobacteraceae	Komagataeibacter	Komagataeibacter europaeus		Vinegar
Monera	Proteobacteria	Acetobacteraceae	Komagataeibacter	Komagataeibacter hansenii		Vinegar
Monera	Proteobacteria	Acetobacteraceae	Komagataeibacter	Komagataeibacter oboediens		Vinegar
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus acetotolerans		Vegetables
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus acidifarinae		Sourdough

	Reference Food Usage	Type Strain	Reference Taxonomy
	Mounier, J., Gelsomino, R., Goerges, S., Vancanneyt, M., Vandemeulebroecke, K., Hoste, B., Scherer, S., Swings, J., Fitzgerald, G.F., Cogan, T.M., 2005. Surface microflora of four smear-ripened cheeses. Appl Environ Microbiol. 71, 6489-500.	DSM 16368	BUSSE, H. J. 2016. Review of the taxonomy of the genus Arthrobacter, emendation of the genus Arthrobacter sensu lato, proposal to reclassify selected species of the genus Arthrobacter in the novel genera Glutamicibacter gen. nov., Paeniglutamicibacter gen. nov., Pseudoglutamicibacter gen. nov., Paenarthrobacter gen. nov. and Pseudarthrobacter gen. nov., and emended description of Arthrobacter roseus. Int. J. Syst. Evol. Microbiol., 66, 9-37.
	Irlinger, F., Bimet, F., Delettre, J., Lefevre, M., Grimont, P.A.D., 2005. Arthrobacter bergerei sp. nov. and Arthrobacter arilaitensis sp. nov., novel coryneform species isolated from the surfaces of cheeses. Int. J. Syst. Evol. Microbiol. 55, 457-462.	DSM 16367	BUSSE, H. J. 2016. Review of the taxonomy of the genus Arthrobacter, emendation of the genus Arthrobacter sensu lato, proposal to reclassify selected species of the genus Arthrobacter in the novel genera Glutamicibacter gen. nov., Paeniglutamicibacter gen. nov., Pseudoglutamicibacter gen. nov., Paenarthrobacter gen. nov. and Pseudarthrobacter gen. nov., and emended description of Arthrobacter roseus. Int. J. Syst. Evol. Microbiol., 66, 9-37.
	Smacchi, E., Gobbetti, M.,Lanciotti, R., Fox, P.F., 1999. Purification and characterization of an extracellular proline imin peptidase from Arthrobana, FEMS Microbiol Lett. 178(1):191-7. Smacchi, E., Fox, P.F., Gobbetti, M. 1999. Purification and characterization of two extracellular proteinases from Arthrobacter nicotianae 9458. FEMS Microbiol Lett. 170, 327-33.	ATCC 14929	BUSSE, H. J. 2016. Review of the taxonomy of the genus Arthrobacter, emendation of the genus Arthrobacter sensu lato, proposal to reclassify selected species of the genus Arthrobacter in the novel genera Glutamicibacter gen. nov., Paeniglutamicibacter gen. nov., Pseudoglutamicibacter gen. nov., Paenarthrobacter gen. nov. and Pseudarthrobacter gen. nov., and emended description of Arthrobacter roseus. Int. J. Syst. Evol. Microbiol., 66, 9-37.
	Mounier, J., Monnet, C., Vallaeys, T., Arditi, R., Sarthou, A.S., Hélias, A., Irlinger, F., 2008. Microbial interactions within a cheese microbial community. Appl Environ Microbiol. 74, 172-81.	ATCC 13337	Møller, V., 1954. Distribution of amino acid decarboxylases in Enterobacteriaceae. Acta Pathologica et Bacteriologica Scandinavica 35, 259-277.
	Hinrichsen, L.L., Montel, M.C., Talon, R., 1994. Proteolytic and lipolytic activities of Micrococcus roseus (65), Halomonas elongata (16) and Vibrio sp. (168) isolated from Danish bacon curing brines. Int J Food Microbiol. 22(2-3), 115-26	ATCC 33173	Vreeland, R.H., Litchfield, C.D., Martin, E.L., Elliot, E., 1980. Halomonas elongata, a new genus and species of extremely salt-tolerant bacteria. Int. J. Syst. Bacteriol. 30, 485-495
	El-Baradei, G., Delacroix-Buchet, A., Ogier, J.C., 2007. Biodiversity of bacterial ecosystems in traditional Egyptian Domiati cheese. Appl Environ Microbiol. 73, 1248-55. Danish list of notified cultures (08/2010)"	DSM 11926T	Kovács, G., Burghardt, J., Pradella, S., Schumann, P., Stackebrandt, E., Màrialigeti, K., 1999. Kocuria palustris sp. nov. and Kocuria rhizophila sp. nov., isolated from the rhizoplane of the narrow-leaved cattail (Typha angustifolia). Int J Syst Bacteriol. 49, 167-73.
	O'Mahony, T., Rekhif, N., Cavadini, C., Fitzgerald, G.F., 2001. The application of a fermented food ingredient containing 'variacin', a novel antimicrobial produced by Kocuria varians, to control the growth of Bacillus cereus in chilled dairy products. J Appl Microbiol. 90, 106-14.	DSM 20033	Stackebrandt, E., Koch, C., Gvozdiak, O., Schumann, P., 1995. Taxonomic dissection of the genus Micrococcus: Kocuria gen. nov., Nesterenkonia gen. nov., Kytococcus gen. nov., Dermacoccus gen. nov., and Micrococcus Cohn 1872 gen. emend. Int. J. Syst. Bacteriol. 45, 682-692. ex Micrococcus varians Migula 1900 (Approved Lists 1980)
	Gullo, M., 2008. Acetic acid bacteria in traditional balsamic vinegar: phenotypic traits relevant for starter cultures selection.Int J Food Microbiol. 125, 46-53.	ATCC 51845	YAMADA (Y.), YUKPAN (P.), VU (H.T.L.), MURAMATSU (Y.) OCHAIKUL (D.) and NAKAGAWA (Y.): Subdivision of the genus Gluconacetobacter Yamada, Hoshino and Ishikawa 1998: the proposal of Komagatabacter gen. nov., for strains accomodated to the Gluconacetobacter xylinus group in the α-Proteobacteria. Ann. Microbiol., 2012, 62, 849-859.
	Torija, M.J., 2010. Identification and quantification of acetic acid bacteria in wine and vinegar by TaqMan-MGB probes. Food Microbio. 27, 257-65.	ATCC 35959	YAMADA (Y.), YUKPAN (P.), VU (H.T.L.), MURAMATSU (Y.) OCHAIKUL (D.) and NAKAGAWA (Y.): Subdivision of the genus Gluconacetobacter Yamada, Hoshino and Ishikawa 1998: the proposal of Komagatabacter gen. nov., for strains accomodated to the Gluconacetobacter xylinus group in the α-Proteobacteria. Ann. Microbiol., 2012, 62, 849-859.
	Sokollek, S.J., Hertel, C., Hammes, W.P., 1998b. Description of Acetobacter oboediens sp. nov. and Acetobacter pomorum sp. nov., two new species isolated from industrial vinegar fermentations. Int. J. Syst. Bacteriol. 48, 935–940.	DSM 11826	YAMADA (Y.), YUKPAN (P.), VU (H.T.L.), MURAMATSU (Y.) OCHAIKUL (D.) and NAKAGAWA (Y.): Subdivision of the genus Gluconacetobacter Yamada, Hoshino and Ishikawa 1998: the proposal of Komagatabacter gen. nov., for strains accomodated to the Gluconacetobacter xylinus group in the α-Proteobacteria. Ann. Microbiol., 2012, 62, 849-859.
	Arici, M., Coskun, F., 2001. Hardaliye: Fermented grape juice as a traditional Turkish beverage. Food Microbiology 18, 417–421.	ATCC 43578	Entani, E., Masai, H., Suzuki, K-I., 1986. Lactobacillus acetotolerans, a New Species from Fermented Vinegar Broth. International Journal of Systematic and Evolutionary Microbiology 36, 544-549.
	Vancanneyt. M., Neysens, P., De Wachter, M., Engelbeen, K., Snauwaert, C., Cleenwerck, I., Van der Meulen, R., Hoste, B., Tsakalidou, E., De Vuyst, L., Swings, J., 2005. Lactobacillus acidifarinae sp. nov. and Lactobacillus zymae sp. nov., from wheat sourdoughs. Int J Syst Evol Microbiol. 55, 615-620.	LMG 2200	Vancanneyt. M., Neysens, P., De Wachter, M., Engelbeen, K., Snauwaert, C., Cleenwerck, I., Van der Meulen, R., Hoste, B., Tsakalidou, E., De Vuyst, L., Swings, J., 2005. Lactobacillus acidifarinae sp. nov. and Lactobacillus zymae sp. nov., from wheat sourdoughs. Int J Syst Evol Microbiol. 55, 615-620.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus acidipiscis		Dairy, Fish
Monera	Fimicutes	Lactobacillaceae	Lactobacillus	Lactobacillus acidophilus		Dairy, vegetables, beer, vegetable juice
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus alimentarius		Meat, Fish
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus amylolyticus		Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus amylovorus		Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus brevis		Dairy, Vegetables, Wine, Beer
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus buchneri		Wine, Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus cacaonum		Cocoa
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus casei	Lactobacillus casei subsp.casei	Dairy, Wine
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus collinoides		Fruits
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus composti		Beverages
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus coryniformis	Lactobacillus coryniformis subsp. coryniformis	Dairy

	Reference Food Usage	Type Strain	Reference Taxonomy
	Asteri, I.A., Robertson, N., Kagkli, D.M., Andrewes, P., Nychas, G., Coolbear, T., Holland, R., Crow, V., Tsakalidou. E., 2009. Technological and flavour potential of cultures isolated from traditional Greek cheeses – A pool of novel species and starters. International Dairy Journal 19, 595-604. Fontana, C., Cappa, F., Rebecchi, A., Cocconcelli, P.S. 2010. Surface microbiota analysis of Taleggio, Gorgonzola, Casera, Scimudin and Formaggio di Fossa Italian cheeses. International Journal of Food Microbiology 138, 205-21."	CIP 106750	Tanasupawat, S., Shida, O., Okada, S., Komagata, K., 2000. Lactobacillus acidipiscis sp. nov. and Weissella thailandensis sp. nov., isolated from fermented fish in Thailand. International Journal of Systematic and Evolutionary Microbiology 50, 1479-85.
	Weiss, N., Busse, M., Kandler, O., 1968. [The origin of fermentation by-products in the lactic acid fermentation of Lactobacillus acidophilus]. Arch Mikrobiol. 62, 85-93.Baroudi, A.A., Collins, E.B., 1976. Microorganisms and characteristics of laban. J Dairy Sci. 59, 200-2. Sohrabvandi, S.; Mousavi, S. M.; Razavi, S. H., Shaheed Behesti, 2010. Viability of probiotic bacteria in low alcohol and non-alcoholic beer during refrigerated storage. 93, 104-109. Buruleanu, Claudia; Nicolescu, Carmen; Avram, Daniela; Manea, Iuliana; Bratu, Magda, 2012. Effects of yeast extract and different amino acids on the dynamics of some components in cabbage juice during fermentation with Bifidobacterium lactis BB-12. Food Science & Biotechnology, 21, 691-699	ATCC 700396	Johnson, J.L., Phelps, C.F., Cummins, C.S., London, J., Gasser, F., 1980. Taxonomy of the Lactobacillus acidophilus Group. International Journal of Systematic and Evolutionary Microbiology 30, 53-68.
	García Fontán, M.C., 2007. Microbiological characteristics of ""androlla"", a Spanish traditional pork sausage. Food Microbiol. 24, 52-8.	ATCC 29643	Reuter, G., 1983. Lactobacillus alimentarius sp. nov., nom. rev. and Lactobacillus farciminis sp. nov., nom. rev. Syst. Appl. Microbiol. 4, 277–279.
	Pedersen, C., 2004. Microbiological characterization of wet wheat distillers' grain, with focus on isolation of lactobacilli with potential as probiotics. Appl Environ Microbiol. 70, 1522-7.	DSM 11664	Bohak, I., Back, W., Richter, L., Ehrmann, M., Ludwig, W., Schleifer, K.H., 1998. Lactobacillus amylolyticus sp. nov., isolated from beer malt and beer wort. Syst. Appl. Microbiol. 21, 360-364.
	Fitzsimons, A. 1994. Development of an amylolytic Lactobacillus plantarum silage strain expressing the Lactobacillus amylovorus alpha-amylase gene. Appl Environ Microbiol. 60, 3529-35.	ATCC 33620	Nakamura, L. K. 1981. Lactobacillus amylovorus, a new starch-hydrolyzing species from cattle waste-corn fermentations. Int. J. Syst. Bacteriol. 31:56–63."
	Pedersen, C.S., Niketic, G., Albury, M.N., 1962. Fermentation of the Yugoslavian pickled cabbage. Appl Microbiol. 10, 86-9. Gordon J., Pilone, Ralph E., Kunkee, and Dinsmoor Webb A (1966): Chemical Characterization of Wines Fermented with Various Malo-lactic Bacteria, APPLIED MICROBIOLOGY, Vol. 14, No. 4, p. 608-615. Pardo I. and Zuniga M 1992 Lactic Acid Bacteria in Spanish Red Rose and White Musts and Wines, JOURNAL OF FOOD SCIENCE, Vol. 57, No. 2, p. 392-396 S. De Cort, H.M.C. Shantha Kumara, H. Verachtert. 1994. Localization and characterization of alpha-glucosidase activity in Lactobacillus brevis. Applied and Environmental Microbiology. Vol. 60, p3074, 5	ATCC 14869	Bergey, D.H., Breed, R.S. Hammer, B.W., Huntoon, F.M., Murray, E.G., Harrison, F.C., 1934. Bergey's Manual of Determinative Bacteriology, 4th ed. Williams andWilkins. Baltimore, MD.
	Poittevin de De Cores, 1966. [Study on malolactic fermentation of wines in Uruguay. V. Study of the metabolism of Lactobacillus plantarum (pentosus and arabinosus) and of Lactobacillus buchneri isolated from wines and their enologic uic use] [Article in Spanish] Rev Latinoam Microbiol Parasitol (Mex) 8, 33-7.	ATCC 4005	Bergey, D.H., Harrison, F.C., Breed, R.S., Hammer, B.W., Huntoon, F.M., 1923. Bergey's Manual of Determinative Bacteriology, 1st ed. Williams and Wilkins. Baltimore, MD.
	De Bruyne, K., Camu, N., De Vuyst, L., Vandamme, P., 2009. Lactobacillus fabifermentans sp. nov. and Lactobacillus cacaonum sp. nov., isolated from Ghanaian cocoa fermentations. Int. J. Syst. Evol. Microbiol. 59, 7-12.	DSM 21116	De Bruyne, K., Camu, N., De Vuyst, L., Vandamme, P., 2009. Lactobacillus fabifermentans sp. nov. and Lactobacillus cacaonum sp. nov., isolated from Ghanaian cocoa fermentations. Int. J. Syst. Evol. Microbiol. 59, 7-12.
	Branen, A.L., Keenan, T.W., 1971. Diacetyl and acetoin production by Lactobacillus casei. Appl Microbiol. 22, 517-21. Lonvaud-Funel A., Joyeux A. and Ledoux O. (1991): Specific enumeration of lactic acid bacteria in fermenting grape must and wine by colony hybridization with non-isotopic DNA Probes, Journal of Applied Bacteriology, Vol. 71, p. 501-508	ATCC 393	Hansen, P.A., Lessel, E.F., 1971. Lactobacillus casei (Orla-Jensen) comb. nov. Int. Syst. Bacteriol. 21, 69–71.
	Carr, J.G., Davies, P.A., 1972. The ecology and classification of strains of Lactobacillus collinoides nov. spec.: A bacterium commonly found in fermenting apple juice. Journal of Applied Bacteriology 35, 463-471.	ATCC 27612	Carr, J.G., Davies, P.A., 1972. The ecology and classification of strains of Lactobacillus collinoides nov. spec.: A bacterium commonly found in fermenting apple juice. Journal of Applied Bacteriology 35, 463-471.
	Endo, A., Okada, S., 2007. Lactobacillus composti sp. nov., a lactic acid bacterium isolated from a compost of distilled shochu residue. Int. J. Syst. Evol. Microbiol., 57, 870-872. NRIC 0689	NRIC 0689	Endo, A., Okada, S., 2007. Lactobacillus composti sp. nov., a lactic acid bacterium isolated from a compost of distilled shochu residue. Int. J. Syst. Evol. Microbiol. 57, 870-872. NRIC 0689
	Hegazi, F.Z., Abo-Elnaga, I.G., 1980. Characters of Lactobacillus coryniformis, isolated from an Iraqi cheese. Zentralbl Bakteriol Naturwiss. 135, 205-11.	ATCC 25602	Abo-Elnaga, I.G., Kandler, O., 1965. Zur Taxonomie der Gattung Lactobacillus Beijerinck. I. Das Subgenus Streptobacterium Orla-Jensen. Zentralblatt fur Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene. Abteilung II 119, 1-36.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus crispatus		Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus crustorum		Sourdough
Monera	Fimicutes	Lactobacillaceae	Lactobacillus	Lactobacillus curvatus	Lactobacillus curvatus subsp. curvatus	Meat, Fish, Vegetables
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus delbrueckii	Lactobacillus delbrueckii subsp. bulgaricus	Dairy
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus delbrueckii	Lactobacillus delbrueckii subsp. delbrueckii	Dairy, Vegetables, Wine
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus delbrueckii	Lactobacillus delbrueckii subsp. lactis	Dairy
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus dextrinicus		Meat
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus diolivorans		Cereals
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus fabifermentans		Cocoa
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus faraginis		beverage
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus farciminis		Soy, Fish
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus fermentum		Sourdough
Monera	Fimicutes	Lactobacillaceae	Lactobacillus	Lactobacillus figidus		Beer

	Reference Food Usage	Type Strain	Reference Taxonomy
	Ehrmann, M.A., Vogel, R.F., 2005. Molecular taxonomy and genetics of sourdough lactic acid bacteria Trends in Food Science & Technology 16, 31-42.	ATCC 33820	Moore, W.E.C., Holdeman, L.V., 1970. Propionibacterium, Arachnia, Actinomyces, Lactobacillus and Bifidobacterium. In: Cato, E.P., Cummins, C.S., Holdeman, L.V., Johnson, J.L., Moore, W.E.C., Smibert, R.M., Smith, L.D.S. (Eds), Outline of Clinical Methods in Anaerobic Bacteriology, 2nd revision, Virginia Polytechnic Institute, Anaerobe Laboratory, Blacksburg, Virginia, 1970, pp. 15-22.
	Ravyts F, De Vuyst L., 2011. Prevalence and impact of single-strain starter cultures of lactic acid bacteria on metabolite formation in sourdough. Food Microbiol 28(6):1129-39.	LMG 23699	Scheirlinck, I., Van der Meulen, R., Van Schoor, A., Huys, G., Vandamme, P., De Vuyst, L., Vancanneyt, M., 2007. Lactobacillus crustorum sp. nov., isolated from two traditional Belgian wheat sourdoughs. Int J Syst Evol Microbiol. 57(Pt 7):1461-7.
	García Fontán, M.C., 2007. Microbiological characteristics of "androlla", a Spanish traditional pork sausage. Food Microbiol. 24, 52-8. Tomé, E., Gibbs, P.A., Teixeira, P.C. 2008. Growth control of Listeria innocua 2030c on vacum-packaged cold-smoked salmon by lactic acid bacteria. IJFM 121, 285-294. Andrighetto C., Lombardi A., Ferrati M., Guidi A., Corrain C., Arcangeli G. 2009 Lactic acid bacteria biodiversity in Italian marinated seafood salad and their interactions on the growth of Listeria monocytogenes. Food Control 20 p462–468. Leroi, F., Cornet, J., Chevalier, F., Cardinal, M., Coeuret, G., Chaillou, S., Joffraud., J.J. 2015. Selection of bioprotective cultures for preventing cold-smoked salmon spoilage. IJFM 213, 79-87. Wouters et al 2013 Species diversity, community dynamics, and metabolite kinetics of spontaneous leek fermentations. Food Microbiology 33 p185-196	ATCC 25601	Abo-Elnaga, I.G., Kandler, O., 1965. Zur Taxonomie der Gattung Lactobacillus Beijerinck. I. Das Subgenus Streptobacterium Orla-Jensen. Zentralblatt fur Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene. Abteilung II 119, 1-36.
	Shahani, K.M., Chandan, R.C., 1979. Nutritional and healthful aspects of cultured and culture-containing dairy foods. J Dairy Sci. 62, 1685-94.	ATCC 11842	Weiss, N., Schillinger, U., Kandler, O., 1983. Lactobacillus lactis, Lactobacillus leichmannii and Lactobacillus bulgaricus, subjective synonyms of Lactobacillus delbrueckii, and description of Lactobacillus delbrueckii subsp. lactis comb. nov. and Lactobacillus delbrueckii subsp. bulgaricus comb. nov. Syst. Appl. Microbiol. 4, 552–557.
	Etchells, J.L., 1964. Pure Culture Fermentation of Brined Cucumbers. Appl Microbiol. 12, 523-35. Gordon J., Pilone, Ralph E., Kunkee, and Dinsmoor Webb A 1966 Chemical Characterization of Wines Fermented with Various Malo-lactic Bacteria, Applied Microbiology 14 No. 4, p. 608-615	ATCC 11842	Beijerinck, M.W. 1901. Anhäufungsversuche mit Ureumbakterien: Ureumspaltung durch Urease und durch Katabolismus. Zentralbl. Bakteriol. Parasitenkde. Infektionskrankh. Hyg. Abt. 2 7, 33–61.
	Lazos, E.S., 1993. The fermentation of trahanas: a milk-wheat flour combination. Plant Foods Hum Nutr. 44, 45-62.	ATCC 12315	Weiss, N., Schillinger, U., Kandler, O., 1983. Lactobacillus lactis, Lactobacillus leichmannii and Lactobacillus bulgaricus, subjective synonyms of Lactobacillus delbrueckii, and description of Lactobacillus delbrueckii subsp. lactis comb. nov. and Lactobacillus delbrueckii subsp. bulgaricus comb. nov. Syst. Appl. Microbiol. 4, 552–557.
	Deibel, R.H., 1961. Microbiology of meat curing. IV. A lyophilized Pediococcus cerevisiae starter culture for fermented sausage. Appl Microbiol. 9, 239-43.	ATCC 33087	Haakensen, M., 2009. Reclassification of Pediococcus dextrinicus (Coster and White 1964) back 1978 (Approved Lists 1980) as Lactobacillus dextrinicus comb. nov., and emended description of the genus Lactobacillus. Int J Syst Evol Microbiol. 59(Pt 3), 615-21.
	Krooneman, J., Faber, F., Alderkamp, A.C., Oude Elferink, S.J.H.W., Driehuis, F., Cleenwerck, I., Swings, J., Gottschal, J.C., Vancanneyt, M., 2002. Lactobacillus diolivorans sp. nov., a 1,2-propanediol-degrading bacterium isolated from aerobically stable maize silage. Int. J. Syst. Evol. Microbiol. 52, 639-646.	DSM 14421	Krooneman, J., Faber, F., Alderkamp, A.C., Oude Elferink, S.J.H.W., Driehuis, F., Cleenwerck, I., Swings, J., Gottschal, J.C., Vancanneyt, M., 2002. Lactobacillus diolivorans sp. nov., a 1,2-propanediol-degrading bacterium isolated from aerobically stable maize silage. Int. J. Syst. Evol. Microbiol. 52, 639-646.
	De Bruyne, K., Camu, N., De Vuyst, L., Vandamme, P., 2009. Lactobacillus fabifermentans sp. nov. and Lactobacillus cacaonum sp. nov., isolated from Ghanaian cocoa fermentations. Int. J. Syst. Evol. Microbiol. 59, 7-12.	DSM 21115	De Bruyne, K., Camu, N., De Vuyst, L., Vandamme, P., 2009. Lactobacillus fabifermentans sp. nov. and Lactobacillus cacaonum sp. nov., isolated from Ghanaian cocoa fermentations. Int. J. Syst. Evol. Microbiol. 59, 7-12.
	Lett Appl Microbiol. 2008 Jun;46(6):626-30. Identification of yeast and bacteria involved in the mezcal fermentation of Agave salmiana. Escalante-Minakata P, Blaschek HP, Barba de la Rosa AP, Santos L, De León-Rodríguez A.	DSM 18382	ENDO (A.) and OKADA (S.): Lactobacillus farraginis sp. nov. and Lactobacillus parafarraginis sp. nov., heterofermentative lactobacilli isolated from a compost of distilled shochu residue. Int. J. Syst. Evol. Microbiol., 2007, 57, 708-712.
	Tanasupawat, S., 2002. Lactic acid bacteria isolated from soy sauce mash in Thailand. J Gen Appl Microbiol. 48, 201-9.	ATCC 29644	Reuter, G. 1983. Lactobacillus alimentarius sp. nov., nom. rev. and Lactobacillus farciminis sp. nov., nom. rev. Syst. Appl. Microbiol. 4, 277–279.
	Khetarpaul, N., Chauhan, B.M., 1991. Biological utilisation of pearl millet flour fermented with yeasts and lactobacilli. Plant Foods Hum Nutr. 41, 309-19.	ATCC 11739	Beijerinck, M.W. 1901. Anhäufungsversuche mit Ureumbakterien: Ureumspaltung durch Urease und durch Katabolismus. Zentralbl. Bakteriol. Parasitenkde. Infektionskrankh. Hyg. Abt. 2 7, 33–61.
	Bhandari, R.R., Walker T.K. 1953. Lactobacillusfrigidus n.sp. Isolated from Brewery Yeast. J. gen. Microbiol. 8 p330-332	NCIB 8518	Bhandari, R.R., Walker T.K. 1953. Lactobacillusfrigidus n.sp. Isolated from Brewery Yeast. J. gen. Microbiol. 8, 330-332. http://www.jcm.riken.jp/cgi-bin/jcm/jcm_keyword?AN=Lactobacillus&BN=parabuchneri&CN=&DN=

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus fructivorans		Beverages, Wine
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus frumenti		Cereals
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus gasseri		Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus ghanensis		Cocoa
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus hammesii		Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus harbinensis		Vegetables
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus helveticus		Dairy, Vegetables
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus hilgardii		Wine
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus homohiochii		Beverages, Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus hordei		Beverages
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus jensenii		Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus johnsonii		Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus kefir		Dairy
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus kefranofaciens	Lactobacillus kefranofaciens subsp kefiranofaciens	Dairy
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus kefranofaciens	Lactobacillus kefranofaciens subsp kefirgranum	Dairy

	Reference Food Usage	Type Strain	Reference Taxonomy
	Vogel, R.F., Böcker, G., Stolz, P. Ehrmann, M., Fanta, D., Ludwig, W., Pot, B., Kersters, K., Schleifer, K.H., Hammes, W.P., 1994. Identification of lactobacilli from sourdough and description of Lactobacillus pontis sp. nov. Int. J. Syst. Bacteriol. 44, 223-229. Pardo I. and Zuniga M 1992 Lactic Acid Bacteria in Spanish Red Rose and White Musts and Wines, Journal of Food Science 57 No. 2, p392-397	ATCC 15435	Charlton, D.B., Melson, M.E., Werkman, C.H. 1934. Physiology of Lactobacillus fructivorans sp. nov., isolatedfrom spoiled salad dressing. J. Sci. 9, 1–11.
	Müller, M.R.A., Ehrmann, M.A., Vogel, R.F., 2000. Lactobacillus frumenti sp. nov., a new lactic acid bacterium isolated from rye-bran fermentations with a long fermentation period. Int. J. Syst. Evol. Microbiol. 50, 2127-2133.	DSM 13145	Müller, M.R.A., Ehrmann, M.A., Vogel, R.F., 2000. Lactobacillus frumenti sp. nov., a new lactic acid bacterium isolated from rye-bran fermentations with a long fermentation period. Int. J. Syst. Evol. Microbiol. 50, 2127-2133.
	Ehrmann, M.A., Vogel, R.F., 2005. Molecular taxonomy and genetics of sourdough lactic acid bacteria. Trends in Food Science & Technology 16, 31-42.	ATCC 33323	Lauer, E., Kandler, O., 1980. Lactobacillus gasseri sp. nov., a new species of the subgenus Thermobacterium. Zentralbl. Bakteriol. Parasitenkde. Infektionskrankh. Hyg. Abt. 1 Orig. C 1, 75–78.
	Nielsen, D.S., Schillinger, U., Franz, C.M.A.P., Bresciani, J., Amoa-Awua, W., Holzapfel, W.H., Jakobsen, M., 2007. Lactobacillus ghanensis sp. nov., a motile lactic acid bacterium isolated from Ghanaian cocoa fermentations. Int. J. Syst. Evol. Microbiol. 57, 1468-1472.	DSM 18630	Nielsen, D.S., Schillinger, U., Franz, C.M.A.P., Bresciani, J., Amoa-Awua, W., Holzapfel, W.H., Jakobsen, M., 2007. Lactobacillus ghanensis sp. nov., a motile lactic acid bacterium isolated from Ghanaian cocoa fermentations. Int. J. Syst. Evol. Microbiol. 57, 1468-1472.
	Valcheva, R., Korakli, M., Onno, B., Prévost, H., Ivanova, I., Ehrmann, M.A., Dousset, X., Gänzle, M.G., Vogel, R.F., 2005. Lactobacillus hammesii sp. nov., isolated from French sourdough. Int. J. Syst. Evol. Microbiol. 55, 763-767.	DSM 16381	Valcheva, R., Korakli, M., Onno, B., Prévost, H., Ivanova, I., Ehrmann, M.A., Dousset, X., Gänzle, M.G., Vogel, R.F., 2005. Lactobacillus hammesii sp. nov., isolated from French sourdough. Int. J. Syst. Evol. Microbiol. 55, 763-767.
	Miyamoto, M., Seto, Y., Hao, D.H., Teshima, T., Sun, Y.B., Kabuki, T., Yao, L.B., Nakajima, H., 2005. Lactobacillus harbinensis sp. nov., consisted of strains isolated from traditional fermented vegetables 'Suan cai' in Harbin, Northeastern China and Lactobacillus perolens DSM 12745. Syst. Appl. Microbiol. 28, 688-694.	DSM 16991	Miyamoto, M., Seto, Y., Hao, D.H., Teshima, T., Sun, Y.B., Kabuki, T., Yao, L.B., Nakajima, H., 2005. Lactobacillus harbinensis sp. nov., consisted of strains isolated from traditional fermented vegetables 'Suan cai' in Harbin, Northeastern China and Lactobacillus perolens DSM 12745. Syst. Appl. Microbiol. 28, 688-694.
	Schafner, D.W., Beuchat, L.R., 1986. Fermentation of aqueous plant seed extracts by lactic Acid bacteria. Appl Environ Microbiol. 51, 1072-6.	ATCC 15009	Bergey, D.H., Harrison, F.C., Breed, R.S., Hammer, B.W., Huntoon, F.M., 1925. Bergey's Manual of Determinative Bacteriology, 2nd ed. Williams and Wilkins. Baltimore, MD.
	Douglas, H.C., Cruess, W.V., 1936. Lactobacillus from california wine: Lactobacillus hilgardii. Food Res. 1, 113–119.	ATCC 8290	Douglas, H.C., Cruess, W.V., 1936. Lactobacillus from california wine: Lactobacillus hilgardii. Food Res. 1, 113–119.
	Kitahara, K., Kaneto, T., Goto, O., 1957. Taxonomic studies on the hiochi-bacteria, specific saprophytes of sake. II. Identification and classification of hiochi-bacteria. Journal of General and Applied Microbiology 3, 111-120.	ATCC 15434	Kitahara, K., Kaneto, T., Goto, O., 1957. Taxonomic studies on the hiochi-bacteria, specific saprophytes of sake. II. Identification and classification of hiochi-bacteria. Journal of General and Applied Microbiology 3, 111-120.
	Rouse, S., Canchaya, C., Van Sinderen, D., 2008. Lactobacillus hordei sp. nov., a bacteriocinogenic strain isolated from malted barley. Int. J. Syst. Evol. Microbiol. 58, 2013-2017.	DSM 19519	Rouse, S., Canchaya, C., Van Sinderen, D., 2008. Lactobacillus hordei sp. nov., a bacteriocinogenic strain isolated from malted barley. Int. J. Syst. Evol. Microbiol. 58, 2013-2017.
	Virtanen, T., 2007. Development of antioxidant activity in milk whey during fermentation with lactic acid bacteria. J Appl Microbiol. 102, 106-15.	ATCC 25258	Gasser, F., Mandel, M., Rogosa, M., 1970. Lactobacillus jensenii sp. nov., a new representative of the subgenus Thermobacterium. J. Gen. Microbiol. 62, 219–222.
	Ehrmann, M.A., Vogel, R.F., 2005. Molecular taxonomy and genetics of sourdough lactic acid bacteria Trends in Food Science & Technology 16, 31-42.	ATCC 49335	Fujisawa, T., Benno, Y., Yaeshima, T., Mitsuoka, T., 1992. Taxonomic study of the Lactobacillus acidophilus group, with recognition of Lactobacillus gallinarum sp. nov. and Lactobacillus johnsonii sp. nov. and synonymy of Lactobacillus acidophilus group A3 (Johnson et al., 1980) with the type strain of Lactobacillus amylovorus (Nakamura 1981). Int. J. Syst. Bacteriol. 42, 487–491.
	Kandler, O., Kunath, P., 1983b. Lactobacillus kefir sp. nov., a component of the microflora of kefir. Syst. Appl. Microbiol. 4, 286–294.	ATCC 35411	Kandler, O., Kunath, P., 1983b. Lactobacillus kefir sp. nov., a component of the microflora of kefir. Syst. Appl. Microbiol. 4, 286–294.
	Fujisawa, T., Adachi, S., Toba, T., Arihara,K., Mitsuoka, T., 1988. Lactobacillus kefiranofaciens sp. nov. Isolated from kefir grains. Int. J. Syst. Bacteriol. 38, 12–14.	ATCC 43761	Fujisawa, T., Adachi, S., Toba, T., Arihara,K., Mitsuoka, T., 1988. Lactobacillus kefiranofaciens sp. nov. Isolated from kefir grains. Int. J. Syst. Bacteriol. 38, 12–14.
	Takizawa, S., Kojima, S., Tamura, S., Fujinaga, S., Benno, Y., Nakase, T., 1994. Lactobacillus kefirgranum sp. nov. And Lactobacillus parakefir sp. nov., two new species from kefir grains. Int J Syst Bacteriol 44, 435–439.	ATCC 51647	Vancanneyt, M., Mengaud, J., Cleenwerck, I., Vanhonacker, K., Hoste, B., Dawyndt, P., Degivry, M.C., Ringuet, D., Janssens, D., Swings, J., 2004. Reclassification of Lactobacillus kefirgranum Takizawa et al. 1994 as Lactobacillus kefiranofaciens subsp. kefirgranum subsp. nov. and emended description of L. kefiranofaciens Fujisawa et al. 1988. Int. J. Syst. Evol. Microbiol., 54, 551-556.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus kisonensis		Vegetables
Monera	Fimicutes	Lactobacillaceae	Lactobacillus	Lactobacillus malefermentans		Beer
Monera	Fimicutes	Lactobacillaceae	Lactobacillus	Lactobacillus mali		Fruits, Wine
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus manihotivorans		Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus mindensis		Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus mucosae		Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus nagelii		Cocoa
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus namurensis		Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus nantensis		Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus nodensis		Dairy
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus oeni		Wine
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus otakiensis		Vegetables
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus panis		Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus parabrevis		Dairy, Vegetables
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus parabuchneri		Sourdough

	Reference Food Usage	Type Strain	Reference Taxonomy
	Watanabe, K., Fujimoto, J., Tomii, Y., Sasamoto, M., Makino, H., Kudo., Y., Okada, S., 2009. Lactobacillus kisonensis sp. nov., Lactobacillus otakiensis sp. nov., Lactobacillus rapi sp. nov. and Lactobacillus sunkii sp. nov., heterofermentative species isolated from sunki, a traditional Japanese pickle. Int. J. Syst. Evol. Microbiol. 59, 754-760.	DSM 19906	Watanabe, K., Fujimoto, J., Tomii, Y., Sasamoto, M., Makino, H., Kudo., Y., Okada, S., 2009. Lactobacillus kisonensis sp. nov., Lactobacillus otakiensis sp. nov., Lactobacillus rapi sp. nov. and Lactobacillus sunkii sp. nov., heterofermentative species isolated from sunki, a traditional Japanese pickle. Int. J. Syst. Evol. Microbiol. 59, 754-760.
	Russell C., Walker T.K. 1953. Lactobacillus malefermentans n.sp., Isolated from Beer. J. gen. Microbiol. 8, 160-162.	ATCC11305 NCIB 8516 NCBI 176292	Validation of the Publication of New Names and New Combinations Previously Effectively Published Outside the IJSB International Journal of Systematic Bacteriology July 1989, p. 371 http://gcm.wfcc.info/speciesPage.jsp?strain_name=Lactobacillus%20malefermentans
	Abo-Elnaga, I.G., Kandler, O., 1965. Zur Taxonomie der Gattung Lactobacillus Beijerinck. I. Das Subgenus Streptobacterium Orla-Jensen. Zentralblatt fur Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene. König, H., Unden, G., Fröhlich, J. 2009. Biology of Microorganisms on Grapes, in Must and in Wine. Springer-Verlag DOI: 10.1007/978-3-540-85463-0. Couto, J.A., Hogg, T.A. 1994. Diversity of ethanol-tolerant lactobacilli isolated from Douro fortified wine: clustering and identification by numerical analysis of electrophoretic protein profiles. J of Appliied Bacteriology 76, 487-491.	ATCC27053	Kaneuchi, C., Seki, M., Komagata, K., 1988. Taxonomic study of Lactobacillus mali Carr and Davis 1970 and related strains: validation of Lactobacillus mali Carr and Davis 1970 over Lactobacillus yamanashiensis Nonomura 1983., Int. J. Syst. Bacteriol. 38, 269-272.
	Morlon-Guyot, J., Guyot, J.P., Pot, B., Jacobe de Haut, I., Raimbault, M., 1998. Lactobacillus manihotivorans sp. nov., a new starch-hydrolysing lactic acid bacterium isolated during cassava sour starch fermentation. Int. J. Syst. Bacteriol. 48, 1101-1109.	DSM 13343	Morlon-Guyot, J., Guyot, J.P., Pot, B., Jacobe de Haut, I., Raimbault, M., 1998. Lactobacillus manihotivorans sp. nov., a new starch-hydrolysing lactic acid bacterium isolated during cassava sour starch fermentation. Int. J. Syst. Bacteriol. 48, 1101-1109.
	Ehrmann, M.A., Müller, M.R.A., Vogel, R.F., 2003, Molecular analysis of sourdough reveals Lactobacillus mindensis sp. nov. Int. J. Syst. Evol. Microbiol. 53, 7-13.	DSM 14500	Ehrmann, M.A., Müller, M.R.A., Vogel, R.F., 2003, Molecular analysis of sourdough reveals Lactobacillus mindensis sp. nov. Int. J. Syst. Evol. Microbiol. 53, 7-13.
	Vieira-Dalodé, G., 2007. Lactic acid bacteria and yeasts associated with gowé production from sorghum in Bénin. J Appl Microbiol. 103, 342-9.	DSM 13345	Roos, S., Karner, F., Axelsson, L., Jonsson, H., 2000. Lactobacillus mucosae sp. nov., a new species with in vitro mucus-binding activity isolated from pig intestine. Int. J. Syst. Evol. Microbiol. 50, 251-258. S32.
	Papalexandratou, Z., Camu, N., Falony, G., de Vuyst, L., 2011. comparison of the bacterial species diversity of spontaneous cocoa bean fermentations carried out at selected farms in Ivory Coast and Brazil. Food Microbiol 28 964-73.	ATCC 700692	Edwards, C.G., Collins, M.D., Lawson, P.A., Rodriguez, A.V., 2000. Lactobacillus nagelii sp. nov., an organism isolated from a partially fermented wine. Int J Syst Evol Microbiol. 50 Pt 2:699-702.
	Scheirlinck, I., Van der Meulen, R., Van Schoor, A., Cleenwerck, I., Huys, G., Vandamme, P., Devuyst, L., Vancanneyt, M., 2007. Lactobacillus namurensis sp. nov., isolated from a traditional Belgian sourdough. Int. J. Syst. Evol. Microbiol. 57, 223-227.	LMG 23582	Scheirlinck, I., Van der Meulen, R., Van Schoor, A., Cleenwerck, I., Huys, G., Vandamme, P., Devuyst, L., Vancanneyt, M., 2007. Lactobacillus namurensis sp. nov., isolated from a traditional Belgian sourdough. Int. J. Syst. Evol. Microbiol. 57, 223-227.
	Valcheva, R., Ferchichi, M.F., Korakli, M., Ivanova, I., Gänzle, M.G., Vogel, R.F., Prévost, H., Onno, B., Dousset, X., 2006. Lactobacillus nantensis sp. nov., isolated from French wheat sourdough. Int. J. Syst. Evol. Microbiol. 56, 587-591.	DSM 19982	Valcheva, R., Ferchichi, M.F., Korakli, M., Ivanova, I., Gänzle, M.G., Vogel, R.F., Prévost, H., Onno, B., Dousset, X., 2006. Lactobacillus nantensis sp. nov., isolated from French wheat sourdough. Int. J. Syst. Evol. Microbiol. 56, 587-591.
	Masoud, W., Takamiya, M., Vogensen, F.K., Lillevang, S., Al-Soud, W.A., Sørensen, S.J., Jakobsen, M., 2010. Characterization of bacterial populations in Danish raw milk cheeses made with different starter cultures by denaturating gradient gel electrophoresis (DGGE) and pyrosequencing. International Dairy Journal 21, 142-148.	DSM 19682	Kashiwagi, T., Suzuki, T., Kamakura, T., 2009. Lactobacillus nodensis sp. nov., isolated from rice bran. Int. J. Syst. Evol. Microbiol. 59, 83-86.
	Manes-Lazaro, R., Ferrer, S., Rossello-Mora, R., Pardo, I., 2009. Lactobacillus oeni sp. nov., from wine. Int. J. Syst. Evol. Microbiol. 59, 2010-2014.	DSM 19972	Manes-Lazaro, R., Ferrer, S., Rossello-Mora, R., Pardo, I., 2009. Lactobacillus oeni sp. nov., from wine. Int. J. Syst. Evol. Microbiol. 59, 2010-2014.
	Watanabe, K., Fujimoto, J., Tomii, Y., Sasamoto, M., Makino, H., Kudo., Y., Okada, S., 2009. Lactobacillus kisonensis sp. nov., Lactobacillus otakiensis sp. nov., Lactobacillus rapi sp. nov. and Lactobacillus sunkii sp. nov., heterofermentative species isolated from sunki, a traditional Japanese pickle. Int. J. Syst. Evol. Microbiol. 59, 754-760.	DSM 19908	Watanabe, K., Fujimoto, J., Tomii, Y., Sasamoto, M., Makino, H., Kudo., Y., Okada, S., 2009. Lactobacillus kisonensis sp. nov., Lactobacillus otakiensis sp. nov., Lactobacillus rapi sp. nov. and Lactobacillus sunkii sp. nov., heterofermentative species isolated from sunki, a traditional Japanese pickle. Int. J. Syst. Evol. Microbiol. 59, 754-760.
	Wiese, B.J., Strohmar, W., Rainey, F.A., Diekmann, H., 1996. Lactobacillus panis sp. nov., from sourdough with a long fermentation period. Int. J. Syst. Bacteriol. 46, 449-453.	DSM 6035	Wiese, B.J., Strohmar, W., Rainey, F.A., Diekmann, H., 1996. Lactobacillus panis sp. nov., from sourdough with a long fermentation period. Int. J. Syst. Bacteriol. 46, 449-453.
	Pedersen, C.S., Niketic, G., Albury, M.N., 1962. Fermentation of the Yugoslavian pickled cabbage. Appl Microbiol. 10, 86-9.	ATCC 53295	Vancanneyt, M., Naser, S.M., Engelbeen, K., De Wachter, M., Van der Meulen, R., Cleenwerck, I., Hoste, B., De Vuyst, L., Swings, J., 2006. Reclassification of Lactobacillus brevis strains LMG 11494 and LMG 11984 as Lactobacillus parabrevis sp. nov. Int. J. Syst. Evol. Microbiol. 56, 1553-1557.
	Farrow, J.A.E., Phillips, B.A., Collins, M.D., 1988. Nucleic acid studies on some heterofermentative lactobacilli: description of Lactobacillus malefermentans sp. nov. and Lactobacillus parabuchneri sp. nov. FEMS Microbiol. Lett. 55, 163-168.	NCIMB 8838	Farrow, J.A.E., Phillips, B.A., Collins, M.D., 1988. Nucleic acid studies on some heterofermentative lactobacilli: description of Lactobacillus malefermentans sp. nov. and Lactobacillus parabuchneri sp. nov. FEMS Microbiol. Lett. 55, 163-168.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Monera	Fimicutes	Lactobacillaceae	Lactobacillus	Lactobacillus paracasei	Lactobacillus paracasei subsp. paracasei	Dairy, Meat, Beer
Monera	Fimicutes	Lactobacillaceae	Lactobacillus	Lactobacillus paracolliniodes		Beer
Monera	Fimicutes	Lactobacillaceae	Lactobacillus	Lactobacillus parafarraginis		Dairy, Vegetables
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus parakefiri		Dairy
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus paralimentarius		Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus paraplantarum		Dairy, Vegetables
Monera	Fimicutes	Lactobacillaceae	Lactobacillus	Lactobacillus pentosus		Dairy, Fruit, Wine, Beer
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus perolens		Dairy, Vegetables
Monera	Fimicutes	Lactobacillaceae	Lactobacillus	Lactobacillus plantarum	Lactobacillus plantarum subsp. plantarum	Dairy, Meat, Fish, Vegetables, Wine, Beer

	Reference Food Usage	Type Strain	Reference Taxonomy
	Sameshima, T., 1998. Effect of intestinal Lactobacillus starter cultures on the behaviour of Staphylococcus aureus in fermented sausage. Int J Food Microbiol. 41, 1-7.Todovrov, S.D., Dicks, L.M.T. 2004. Screening of Lactic Acid Bacteria from South African Barley Beer for Production of Bacteriocin-like Compounds. Folia Microbiol 49 (4) 406-410	ATCC 25302	Collins, M.D., Phillips, B.A., Zanoni, P., 1989. Deoxyribonucleic acid homology studies of Lactobacillus casei, Lactobacillus paracasei sp. nov., subsp. paracasei and subsp. tolerans, and Lactobacillus rhamnosus sp. nov., comb. nov. Int. J. Syst. Bacteriol. 39, 105–108.
	SUZUKI (K.), FUNAHASHI (W.), KOYANAGI (M.) and YAMASHITA (H.): Lactobacillus paracollinoides sp. nov., isolated from brewery environments. Int. J. Syst. Evol. Microbiol., 2004, 54, 115-117.	DSM 15502	SUZUKI (K.), FUNAHASHI (W.), KOYANAGI (M.) and YAMASHITA (H.): Lactobacillus paracollinoides sp. nov., isolated from brewery environments. Int. J. Syst. Evol. Microbiol., 2004, 54, 115-117.
	Wu J., Du R., Gao M., Sui Y., Xiu L., and Wang X. 2014. Naturally Occurring Lactic Acid Bacteria Isolated from Tomato Pomace Silage, Asian Australas. J. Anim. Sci. 27, 648-657. Montaño A., Sánchez A.H., Casado F.J., Beato V.M., Castro, A. 2013. Degradation of ascorbic acid and potassium sorbate by different Lactobacillus species isolated from packed green olives. Food Microbiology 34, 7-11. Zanirati D.F., Abatemarco M.Jr. , Sandes S.H. de C., Nicoli J.R., Nunes A.C., Neumann, E. 2015. Selection of lactic acid bacteria from Brazilian kefir grains for potential use as starter or probiotic cultures. Anaerobe 32, 70-76.	DSM 18390	Endo, A, Okada, S. 2007. Lactobacillus farraginis sp. nov. and Lactobacillus parafarraginis sp. nov., heterofermentative lactobacilli isolated from a compost of distilled shochu residue. Int J Syst Evol Microbiol. 57(Pt 4):708-12.
	Takizawa, S., Kojima, S., Tamura, S., Fujinaga, S., Benno, Y., Nakase, T., 1994. Lactobacillus kefirgranum sp. nov. and Lactobacillus parakefir sp. nov., two new species from kefir grains. Int. J. Syst. Bacteriol. 44, 435–439.	ATCC 51648	Takizawa, S., Kojima, S., Tamura, S., Fujinaga, S., Benno, Y., Nakase, T., 1994. Lactobacillus kefirgranum sp. nov. and Lactobacillus parakefir sp. nov., two new species from kefir grains. Int. J. Syst. Bacteriol. 44, 435–439.
	Cai, Y., Okada, H., Mori, H., Benno, Y., Nakase, T., 1999. Lactobacillus paralimentarius sp. nov., isolated from sourdough. Int. J. Syst. Bacteriol. 49, 1451-1455.	JCM 10415	Cai, Y., Okada, H., Mori, H., Benno, Y., Nakase, T., 1999. Lactobacillus paralimentarius sp. nov., isolated from sourdough. Int. J. Syst. Bacteriol. 49, 1451-1455.
	Manolopoulou, E., 2003. Evolution of microbial populations during traditional Feta cheese manufacture and ripening. Int J Food Microbiol. 82, 153-61.	ATCC 700211	Curk, M.-C., Hubert, J.-C., Bringel, F., 1996. Lactobacillus paraplantarum sp. nov., a new species related to Lactobacillus plantarum. Int. J. Syst. Bacteriol. 46, 595–598.
	Poittevin de De Cores, Carrasco, A., 1966. [Study on malolactic fermentation of wines in Uruguay. V. Study of the metabolism of Lactobacillus plantarum (pentosus and arabinosus) and of Lactobacillus buchneri isolated from wines and their enologic uic use]. Rev Latinoam Microbiol Parasitol (Mex) 8, 33-7. Todovrov, S.D., Dicks, L.M.T. 2004. Screening of Lactic Acid Bacteria from South African Barley Beer for Production of Bacteriocin-like Compounds. Folia Microbiol 49 (4) 406-410 http://www.biomed.cas.cz/mbu/folia/	ATCC 8041	Zanoni, P.J., Farrow, A.E., Phillips, B.A., Collins, M.D., 1987. Lactobacillus pentosus (Fred, Peterson, and Anderson) sp. nov., nom. rev. Int. J. Syst. Bacteriol.37, 339–341.
	Ongol, M.P., 2009. Main microorganisms involved in the fermentation of Ugandan ghee. Int J Food Microbiol. 133, 286-91. Miyamoto, M., 2005. Lactobacillus harbinensis sp. nov., consisted of strains isolated from traditional fermented vegetables 'Suan cai' in Harbin, Northeastern China and Lactobacillus perolens DSM 12745. Syst Appl Microbiol. 28, 688-94. Henri-Dubernet, S., 2008. Diversity and dynamics of lactobacilli populations during ripening of RDO Camembert cheese. Can J Microbiol. 54, 218-228.	DSM 12744	Back, W., Bohak, I., Ehrmann, M., Ludwig, W., Pot, B., Kersers, K., Schleifer, K.H., 1999. Lactobacillus perolens sp. nov., a soft drink spoilage bacterium. Syst. Appl. Microbiol. 22, 354-359. DSM 12744.
	Orillo, C.A., Pederson, C.S., 1968. Lactic acid bacterial fermentation of burong dalag. Appl Microbiol. 16, 1669-71. Jeppesen, V. F., Huss, H. H. 1993. Characteristics and anatgonistic activity of lactic acic bacteria isolated from chille fish products. IJFM 18, 305-320. Fricourt et al 1994 L plantarum BF001 Isolated from Processed Channel Catfish. J Food Protection 57 p698-702. Trias R., Baneras L., Badosa E., Montesinos E. 2008 Bioprotection of Golden Delicious apples and Iceberg lettuce against foodborne bacterial pathogens by lactic acid bacteria IJFM 123 p50-60. König, H., Unden, G., Fröhlich, J. 2009. Biology of Microorganisms on Grapes, in Must and in Wine. Springer-Verlag DOI: 10.1007/978-3-540-85463-0 Calo P., Cansado J., Velfizquez J.B., Sieiro C., Longo E. and Villa T.G. 1991 Effect of diffrent physioco-chemical condition on malolactic fermentation of four lactobacillus plantarum wild strains isolated from wines of Northwestern Spain Biotechnology Letters 13 No 11 p781-787. Velázquez, J.B., Carlo, P., Longo, E., Cansado, J., Sieiro, C., Villa T.G. 1991. Effect of L-Malate, D-Glucose and L-Lactate on malolactic Fermentation and Growth of Lactobacillus plantarum and Lactobacillus curvatus Wild Strains Isolated from Wine J.of Fermentetion and Bioengineering 71 No 5, 363-366. Bhandari, R.R., Russell, C., Walker, T.K. 1954.Study of Lactic Acid Bacteria Associated with Brewery Products. J.Sc.. Food Agri. January 5, 27-31. Todovrov, S.D., Dicks, L.M.T. 2004. Screening of Lactic Acid Bacteria from South African Barley Beer for Production of Bacteriocin-like Compounds. Folia Microbiol 49 (4) 406-410 http://www.biomed.cas.cz/mbu/folia/	ATCC 14917	Bergey, D.H., Harrison, F.C., Breed, R.S., Hammer, B.W., Huntoon, F.M., 1923. Bergey's Manual of Determinative Bacteriology, 1st ed. Williams and Wilkins. Baltimore, MD.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus pobuzihii		Vegetables
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus pontis		Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus rapi		Vegetables
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus reuteri		Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus rhamnosus		Dairy, Vegetables, Meat
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus rossiae		Sourdough
Monera	Fimicutes	Lactobacillaceae	Lactobacillus	Lactobacillus sakei	Lactobacillus sakei subsp carnosus	Meat
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus sakei	Lactobacillus sakei subsp. sakei	Meat, Beverages
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus salivarius	Lactobacillus salivarius subsp. Salivarius	Dairy
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus sanfranciscensis		Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus satsumensis		Vegetables
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus secaliphilus		Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus senmaizukei		Vegetables
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus siliginis		Sourdough
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus similis		Vegetables
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus spicheri		Sourdough

	Reference Food Usage	Type Strain	Reference Taxonomy
	Chen, Y.S., Miyashita, M., Suzuki, K., Sato, H., Hsu, J.S., Yanagida, F., 2010. Lactobacillus pobuzihii sp. nov., isolated from pobuzihi (fermented cummingcordia). Int. J. Syst. Evol. Microbiol. 60, 1914-1917.	NBRC 103219	Chen, Y.S., Miyashita, M., Suzuki, K., Sato, H., Hsu, J.S., Yanagida, F., 2010. Lactobacillus pobuzihii sp. nov., isolated from pobuzihi (fermented cummingcordia). Int. J. Syst. Evol. Microbiol. 60, 1914-1917.
	Vogel, R.F., Böcker, G., Stolz, P., Ehrmann, M., Fanta, D., Ludwig, W., Pot, B., Kersters, K., Schleifer, K.H., Hammes, W.P., 1994. Identification of lactobacilli from sourdough and description of Lactobacillus pontis sp. nov. Int. J. Syst. Bacteriol. 44, 223-229.	DSM 8475	Vogel, R.F., Böcker, G., Stolz, P., Ehrmann, M., Fanta, D., Ludwig, W., Pot, B., Kersters, K., Schleifer, K.H., Hammes, W.P., 1994. Identification of lactobacilli from sourdough and description of Lactobacillus pontis sp. nov. Int. J. Syst. Bacteriol. 44, 223-229.
	Watanabe, K., Fujimoto, J., Tomii, Y., Sasamoto, M., Makino, H., Kudo., Y., Okada, S., 2009. Lactobacillus kisonensis sp. nov., Lactobacillus otakiensis sp. nov., Lactobacillus rapi sp. nov. and Lactobacillus sunkii sp. nov., heterofermentative species isolated from sunki, a traditional Japanese pickle. Int. J. Syst. Evol. Microbiol. 59, 754-760.	DSM 19907	Watanabe, K., Fujimoto, J., Tomii, Y., Sasamoto, M., Makino, H., Kudo., Y., Okada, S., 2009. Lactobacillus kisonensis sp. nov., Lactobacillus otakiensis sp. nov., Lactobacillus rapi sp. nov. and Lactobacillus sunkii sp. nov., heterofermentative species isolated from sunki, a traditional Japanese pickle. Int. J. Syst. Evol. Microbiol. 59, 754-760.
	Ehrmann, M.A., Vogel, R.F., 2005. Molecular taxonomy and genetics of sourdough lactic acid bacteria Trends in Food Science & Technology 16, 31-42.	ATCC 23272	[Kandler, O., Stetter, K.O., Köhl, R., 1980. Lactobacillus reuteri sp. nov., a new species of heterofermentative lactobacilli. Zentralbl. Mikrobiol. Parasitenkd. Infektionskr. Hyg. Abt. 1 Orig. C1, 264-269.]
	Lee, H., Yoon, H., Ji, Y., Kim, H.,Park, H., Lee, J., Shin, H., Holzapfel, W. 2011. Functional properties of Lactobacillus strains isolated from kimchi. Int J Food Microbiol. 145, 155-61.	ATCC 7469	Collins, M.D., Phillips, B.A., Zanoni, P., 1989. Deoxyribonucleic acid homology studies of Lactobacillus casei, Lactobacillus paracasei sp. nov., subsp. paracasei and subsp. tolerans, and Lactobacillus rhamnosus sp. nov., comb. nov. Int. J. Syst. Bacteriol. 39, 105–108.
	Corsetti, A., Settanni, L., Van Sinderen, D., Felis, G.E., Dellaglio, F., Gobbetti, M., 2005. Lactobacillus rossii sp. nov., isolated from wheat sourdough. Int. J. Syst. Evol. Microbiol. 55, 35-40.	DSM 15814	Corsetti, A., Settanni, L., Van Sinderen, D., Felis, G.E., Dellaglio, F., Gobbetti, M., 2005. Lactobacillus rossii sp. nov., isolated from wheat sourdough. Int. J. Syst. Evol. Microbiol. 55, 35-40.
	Bover-Cid, S., 2000. Mixed starter cultures to control biogenic amine production in dry fermented sausages. J Food Prot. 63, 1556-62. Hammes W.P. & Knauf H.J. 1994 Starters in the Processing of Meat Products. Meat Science 36 p 155-168	CCUG 31331	Torriani, S., Van Reenen, C.A., Klein, G., Reuter, G., Dellaglio, F., Dicks, L.M.T., 1996. Lactobacillus curvatus subsp. curvatus subsp. nov. and Lactobacillus curvatus subsp. melibiosus subsp. nov. and Lactobacillus sake subsp. sake subsp. nov. and Lactobacillus sake subsp. carnosus subsp. nov., new subspecies of Lactobacillus curvatus Abo-Elnaga and Kandler 1965 and Lactobacillus sake Katagiri, Kitahara, and Fukami 1934 (Klein et al. 1996, emended descriptions), respectively. Int. J. Syst. Bacteriol. 46, 1158-1163.
	Bover-Cid, S., 2000. Mixed starter cultures to control biogenic amine production in dry fermented sausages. J Food Prot. 63; 1556-62. [Katagiri, H., Kitahara, K., Fukami, K., 1934. The characteristics of the lactic acid bacteria isolated from moto, yeast mashes for sake manufacture. IV. Classification of the lactic acid bacteria. Bulletin of the Agricultural Chemical Society of Japan 10, 156-157.]	ATCC 15521	[Katagiri, H., Kitahara, K., Fukami, K., 1934. The characteristics of the lactic acid bacteria isolated from moto, yeast mashes for sake manufacture. IV. Classification of the lactic acid bacteria. Bulletin of the Agricultural Chemical Society of Japan 10, 156-157.]
	Coulin, P., 2006. Characterisation of the microflora of attiéké, a fermented cassava product, during traditional small-scale preparation. Int J Food Microbiol. 106, 131-6.	ATCC 11741	[Rogosa, M., Wiseman, R.F., Mitchell, J.A., Disraely, M.N., 1953. Species differentiation of oral lactobacilli from man including descriptions of Lactobacillus salivarius nov. spec. and Lactobacillus cellobiosus nov. spec. Journal of Bacteriology 65, 681-699.]
	Vogel, R.F., 1999. Non-dairy lactic fermentations: the cereal world. Antonie Van Leeuwenhoek 76(1-4), 403-11.	ATCC 27651	Weiss, N., Schillinger, U., 1984. Lactobacillus sanfrancisco sp. nov., nom. rev. Syst. Appl. Microbiol. 5, 230-232.
	Endo, A., Okada, S., 2005. Lactobacillus satsumensis sp. nov., isolated from mashes of shochu, a traditional Japanese distilled spirit made from fermented rice and other starchy materials. Int. J. Syst. Evol. Microbiol. 55, 83-85.	NRIC 0604	Endo, A., Okada, S., 2005. Lactobacillus satsumensis sp. nov., isolated from mashes of shochu, a traditional Japanese distilled spirit made from fermented rice and other starchy materials. Int. J. Syst. Evol. Microbiol. 55, 83-85.
	Ehrmann, M.A., Brandt, M., Stolz, P., Vogel, R.F., Korakli, M., 2007. Lactobacillus secaliphilus sp. nov., isolated from type II sourdough fermentation. Int. J. Syst. Evol. Microbiol. 57, 745-750.	DSM 17896	Ehrmann, M.A., Brandt, M., Stolz, P., Vogel, R.F., Korakli, M., 2007. Lactobacillus secaliphilus sp. nov., isolated from type II sourdough fermentation. Int. J. Syst. Evol. Microbiol. 57, 745-750.
	Hiraga, K., Ueno,Y., Sukontasing, S., Tanasupawat, S., Oda, K., 2008. Lactobacillus senmaizukei sp. nov., isolated from Japanese pickle. Int. J. Syst. Evol. Microbiol. 58, 1625-1629.	NBRC 103853	Hiraga, K., Ueno,Y., Sukontasing, S., Tanasupawat, S., Oda, K., 2008. Lactobacillus senmaizukei sp. nov., isolated from Japanese pickle. Int. J. Syst. Evol. Microbiol. 58, 1625-1629.
	Aslam, Z., IM, W.T., Ten, L.N., Lee, M.J., Kim, K.H., Lee, S.T., 2006. Lactobacillus siliginis sp. nov., isolated from wheat sourdough in South Korea. Int. J. Syst. Evol. Microbiol. 56, 2209-2213.	NBRC 101315	Aslam, Z., IM, W.T., Ten, L.N., Lee, M.J., Kim, K.H., Lee, S.T., 2006. Lactobacillus siliginis sp. nov., isolated from wheat sourdough in South Korea. Int. J. Syst. Evol. Microbiol. 56, 2209-2213.
	Kitahara, M., Sakamoto, M., Benno, Y., 2010. Lactobacillus similis sp. nov., isolated from fermented cane molasses. Int. J. Syst. Evol. Microbiol. 60, 187-190.	JCM 2765	Kitahara, M., Sakamoto, M., Benno, Y., 2010. Lactobacillus similis sp. nov., isolated from fermented cane molasses. Int. J. Syst. Evol. Microbiol. 60, 187-190.
	Meroth, C.B., Hammes, W.P., Hertel, C., 2004. Characterisation of the microbiota of rice sourdoughs and description of Lactobacillus spicheri sp. nov. Syst. Appl. Microbiol. 27, 151-159.	DSM 15429	Meroth, C.B., Hammes, W.P., Hertel, C., 2004. Characterisation of the microbiota of rice sourdoughs and description of Lactobacillus spicheri sp. nov. Syst. Appl. Microbiol. 27, 151-159.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus suebicus		Fruits
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus sunkii		Vegetables
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus tucceti		Dairy, Meat
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus vaccinostercus		Fruits, Vegetables, Cocoa
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus versmoldensis		Meat
Monera	Firmicutes	Lactobacillaceae	Lactobacillus	Lactobacillus zymae		Vegetables
Monera	Firmicutes	Streptococaceae	Lactococcus	Lactococcus lactis	Lactococcus lactis subsp. lactis	Dairy, Meat, Fish, Beer, Wine
Monera	Firmicutes	Streptococaceae	Lactococcus	Lactococcus lactis	Lactococcus lactis subsp. cremoris	Dairy
Monera	Fimicutes	Streptococaceae	Lactococcus	Lactococcus piscium		Fish
Monera	Firmicutes	Streptococaceae	Lactococcus	Lactococcus raffinolactis		Dairy
Monera	Actinobacteria	Microbacteriaceae	Leucobacter	Leucobacter komagatae		Dairy

	Reference Food Usage	Type Strain	Reference Taxonomy
	Kleynmans, U., Heinzl, H., Hammes, W.P., 1989. Lactobacillus suebicus sp. nov., an obligately heterofermentative Lactobacillus species isolated from fruit mashes. Syst. Appl. Microbiol. 11, 267-271.	DSM 5007	Kleynmans, U., Heinzl, H., Hammes, W.P., 1989. Lactobacillus suebicus sp. nov., an obligately heterofermentative Lactobacillus species isolated from fruit mashes. Syst. Appl. Microbiol. 11, 267-271.
	Watanabe, K., Fujimoto, J., Tomii, Y., Sasamoto, M., Makino, H., Kudo., Y., Okada, S., 2009. Lactobacillus kisonensis sp. nov., Lactobacillus otakiensis sp. nov., Lactobacillus rapi sp. nov. and Lactobacillus sunkii sp. nov., heterofermentative species isolated from sunki, a traditional Japanese pickle. Int. J. Syst. Evol. Microbiol. 59, 754-760.	DSM 19904	Watanabe, K., Fujimoto, J., Tomii, Y., Sasamoto, M., Makino, H., Kudo., Y., Okada, S., 2009. Lactobacillus kisonensis sp. nov., Lactobacillus otakiensis sp. nov., Lactobacillus rapi sp. nov. and Lactobacillus sunkii sp. nov., heterofermentative species isolated from sunki, a traditional Japanese pickle. Int. J. Syst. Evol. Microbiol. 59, 754-760.
	Chenoll, E., Macian, M.C., Aznar, R., 2006. Lactobacillus tucceti sp. nov., a new lactic acid bacterium isolated from sausage. Syst. Appl. Microbiol. 29, 389-395. Masoud, W., Takamiya, M., Vogensen, F.K., Lillevang, S., Al-Soud, W.A., Sørensen, S.J., Jakobsen, M., 2010. Characterization of bacterial populations in Danish raw milk cheeses made with different starter cultures by denaturating gradient gel electrophoresis (DGGE) and pyrosequencing. International Dairy Journal 21, 142-148.	DSM 20183	Chenoll, E., Macian, M.C., Aznar, R., 2006. Lactobacillus tucceti sp. nov., a new lactic acid bacterium isolated from sausage. Syst. Appl. Microbiol. 29, 389-395.
	Arici, M., Coskun, F., 2001. Hardaliye: Fermented grape juice as a traditional Turkish beverage. Food Microbiology 18, 417–421. Papalexandratou, Z., Camu, N., Falony, G., de Vuyst, L., 2011. comparison of the bacterial species diversity of spontaneous cocoa bean fermentations carried out at selected farms in Ivory Coast and Brazil. Food Microbiol 28 964-73.	ATCC 33310	Kozaki, M., Okada, S., 1983. Lactobacillus vaccinostercus sp. nov. In: Validation of the Publication of New Names and New Combinations Previously Effectively Published Outside the IJSB, List no. 10. Int J Syst Bacteriol 33, 438–440.
	Kröckel, L., Schillinger, U., Franz, C.M.A.P., Bantleon, A., Ludwig, W., 2003. Lactobacillus versmoldensis sp. nov., isolated from raw fermented sausage. Int. J. Syst. Evol. Microbiol. 53, 513-517.	DSM 14857	Kröckel, L., Schillinger, U., Franz, C.M.A.P., Bantleon, A., Ludwig, W., 2003. Lactobacillus versmoldensis sp. nov., isolated from raw fermented sausage. Int. J. Syst. Evol. Microbiol. 53, 513-517.
	Cheng L, Luo J, Li P, Yu H, Huang J, Luo L., 2014. Microbial diversity and flavor formation in onion fermentation. Food Funct. 5(9):2338-47.	LMG 22198	Vancanneyt M, Neysens P, De Wachter M, Engelbeen K, Snauwaert C, Cleenwerck I, Van der Meulen R, Hoste B, Tsakalidou E, De Vuyst L, Swings J., 2005. Lactobacillus acidifarinae sp. nov. and Lactobacillus zymae sp. nov., from wheat sourdoughs. Int J Syst Evol Microbiol. 55(Pt 2):615-20.
	Thomas, T.D., Turner, K.W., Crow, V.L., 1980. Galactose fermentation by Streptococcus lactis and Streptococcus cremoris: pathways, products, and regulation. J Bacteriol. 144, 672-82. Rodriguez J.M., Cintas L.M., Casaus P., Horn N., Dodd H.M., Hernandez P.E. Gasson M.J. 1995 Isolation of nisin-producing Lactococcus lactis strains from dry fermented sausages. J Applied Bacteriology 79 p109-115. Campos, C.A., Rodrıguez, O., Calo-Mata, P., Prado, M., Barros-Velazquez, J. 2006. Preliminary characterization of bacteriocins from Lactococcus lactis, Enterococcus faecium and Enterococcus mundtii strains isolated from turbot (Psetta maxima) Food Research International 39 p356–364. Sarika, A.R., Lipton, A.P., Aishwarya, M.S., Dhivya, R.S. 2012. Isolation of Bacteriocin-Producing Lactococccus lactis and Application of Its Bacteriocin to Manage Spoilage Baceria in High-Value Marine Fish Under Different Storage Temperatures. Appl. Biochem Biotechnol 167, 1280-1289. Uhlman L., Schillinger U., Rupnow J.R. and Holzapfel W.H. 1992 Identification and characterization of two bacteriocin-producing strains of Lactococcus lactis isolated from vegetables. IJFM 16 p141-151 Todorov, S.D., Dicks, L.M.T. 2004. Screening of Lactic-Acid Bacteria from South African Barley Beer for Production of Bacteriocin-like Compounds Folia Microbiol. 49 (4) 406-410, Lui H.C. & Lui S.S.T. 1981 Effects of malo-lactic fermentative bacteria on the acidity of white wine, Taiwania, Vol. 26	ATCC 19435	Lister, J., 1873. A further contribution to the natural history of bacteria and the germ theory of fermentative changes. Quart. Microbiol. Sci. 13, 380–408.
	Thomas, T.D., Turner, K.W., Crow, V.L., 1980. Galactose fermentation by Streptococcus lactis and Streptococcus cremoris: pathways, products, and regulation. J Bacteriol. 144, 672-82.	ATCC 19257	Orla-Jensen, S. 1924. La classification des bactéries lactiques. Lait 4, 468–474.
	Leroi, F., Cornet, J., Chevalier, F., Cardinal, M., Coeuret, G., Chaillou, S., Joffraud., J.J. 2015. Selection of bioprotective cultures for preventing cold-smoked salmon spoilage. IJFM 213, 79-87. Saraoui T, Leroi F, Bjorkroth J. and Pilet M.F. 2016 Lactococcus piscium: a psychrotrophic lactic acid bacterium with bioprotective or spoilage activity in food—a review. Journal of Applied Microbiology 121 p907-918	ATCC 700018	Williams, A.M., Fryer, J.L., Del Collins, M. 1990. Lactococcus piscium sp. Nov. A new Lactococcus species from salmonid fish. FEMS Micribiology Letters 56, 109-113.
	Ouadghiri, M.,Amar, M., Vancanneyt, M., Swings, J., 2005. Biodiversity of lactic acid bacteria in Moroccan soft white cheese (Jben).FEMS Microbiol Lett. 251, 267-71.	ATCC 43920	Orla-Jensen, A.D., Hansen, P.A., 1932. The bacteriological flora of spontaneously soured milk and of commercial starters for butter making. Zentralbl. Bakteriol. Parasitenkd. Infektionskr Hyg. Abt. 2 86, 6-29.
	Mounier J, Monnet C, Jacques N, Antoinette A, Irlinger F. 2009. Assessment of the microbial diversity at the surface of Livarot cheese using culture-dependent and independent approaches. Int J Food Microbiol. 133,31-7.	DSM8803	Takeuchi M., Weiss N., Schumann P. and Yokota A. 1996. Leucobacter komagatae gen. nov., sp. nov., a new aerobic gram-positive, nonsporulating rod with 2,4-diaminobutyric acid in the cell wall. Int. J. Syst. Bacteriol. 46,967-971.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Monera	Fimicutes	Leuconostocaceae	Leuconostoc	Leuconostoc carnosum		Meat, Fish
Monera	Firmicutes	Leuconostocaceae	Leuconostoc	Leuconostoc citreum		Dairy, Fish
Monera	Firmicutes	Leuconostocaceae	Leuconostoc	Leuconostoc fallax		Vegetables
Monera	Firmicutes	Leuconostocaceae	Leuconostoc	Leuconostoc holzapfelii		Coffee
Monera	Firmicutes	Leuconostocaceae	Leuconostoc	Leuconostoc inhae		Vegetables
Monera	Firmicutes	Leuconostocaceae	Leuconostoc	Leuconostoc kimchii		Vegetables
Monera	Firmicutes	Leuconostocaceae	Leuconostoc	Leuconostoc lactis		Dairy
Monera	Firmicutes	Leuconostocaceae	Leuconostoc	Leuconostoc mesenteroides	Leuconostoc mesenteroides subsp. mesenteroides	Dairy, Vegetables , wine
Monera	Firmicutes	Leuconostocaceae	Leuconostoc	Leuconostoc mesenteroides	Leuconostoc mesenteroides subsp.cremoris	Dairy
Monera	Firmicutes	Leuconostocaceae	Leuconostoc	Leuconostoc mesenteroides	Leuconostoc mesenteroides subsp. dextranicum	Dairy
Monera	Firmicutes	Leuconostocaceae	Leuconostoc	Leuconostoc mesenteroides	Leuconostoc mesenteroides subsp. mesenteroides	Dairy, Vegetables
Monera	Firmicutes	Leuconostocaceae	Leuconostoc	Leuconostoc palmae		Wine
Monera	Firmicutes	Leuconostocaceae	Leuconostoc	Leuconostoc paramesenteroides		Wine

	Reference Food Usage	Type Strain	Reference Taxonomy
	Jacobsen, T., Budde, B.B., Koch, A.G., 2003. Application of Leuconostoc carnosum for biopreservation of cooked meat products. J Appl Microbiol. 95, 242-249. Keppler, K., Geisen, R., Holzapfel, W.H., 1994. An alfa-amylase sensitive bacteriocin of Leuconostoc carnosum. Food Microbiology 11, 39-45. Laack, R.L.J.M. van, Schillinger, U., Holzapfel, W.H. 1992. Characterization and partial purification of a bacteriocin produced by leuconostoc carnosum LA44A. IJFM 16, 183-195. Jeppesen V.F. and Huss H.H. 1994 Characteristics and antagonistic activity of LAB isolated from chilled fish products IJFM 18 p305-320	ATCC 49367	Shaw, B. G., Harding, C.D., 1989. Leuconostoc gelidum sp. nov and sp. nov. Leuconostoc gelidum from chillstored meats. Int. J. Syst. Bacteriol. 39, 217–223.
	"Cibik, R., 2000. Molecular diversity of leuconostoc mesenteroides and leuconostoc citreum isolated from traditional french cheeses as revealed by RAPD fingerprinting, 16S rDNA sequencing and 16S rDNA fragment amplification. Syst Appl Microbiol. 23, 267-78. Paludan-Müller, C., 1999. Characterization of lactic acid bacteria isolated from a Thai low-salt fermented fish product and the role of garlic as substrate for fermentation. Int J Food Microbiol. 46, 219-29."	ATCC 13146	Farrow, J.A.E., Facklam, R.R., Collins, M.D., 1989. Nucleic acid homologies of some vancomycin-resistant leuconostocs and description of Leuconostoc citreum sp. nov. and Leuconostoc pseudomesenteroides sp. nov. Int. J. Syst. Bacteriol. 39, 279-283.
	"Barrangou, R., 2002. Identification and characterization of Leuconostoc fallax strains isolated from an industrial sauerkraut fermentation. Appl Environ Microbiol. 68, 2877-84."	ATCC 700006	Martinez-Murcia, A.J., Collins, M.D., 1991. A phylogenetic analysis of an atypical leuconostoc: description of Leuconostoc fallax sp. nov. FEMS Microbiol. Lett. 82, 55-60. VL 40.
	De Bruyne, K., Schillinger, U., Caroline, L., Boehringer, B., Cleenwerck, I., Vancanneyt, M., De Vuys, L., Franz, C.M.A.P., Vandamme, P., 2007.Leuconostoc holzapfelii sp. nov., isolated from Ethiopian coffee fermentation and assessment of sequence analysis of housekeeping genes for delineation of Leuconostoc species. Int. J. Syst. Evol. Microbiol. 57, 2952-2959.	DSM 20189	De Bruyne, K., Schillinger, U., Caroline, L., Boehringer, B., Cleenwerck, I., Vancanneyt, M., De Vuys, L., Franz, C.M.A.P., Vandamme, P., 2007.Leuconostoc holzapfelii sp. nov., isolated from Ethiopian coffee fermentation and assessment of sequence analysis of housekeeping genes for delineation of Leuconostoc species. Int. J. Syst. Evol. Microbiol. 57, 2952-2959.
	Kim, B., Lee, J., Jang, J., Kim, J., Han, H., 2003. Leuconostoc inhae sp. nov., a lactic acid bacterium isolated from kimchi. Int. J. Syst. Evol. Microbiol. 53, 1123-1126.	DSM 1510	Kim, B., Lee, J., Jang, J., Kim, J., Han, H., 2003. Leuconostoc inhae sp. nov., a lactic acid bacterium isolated from kimchi. Int. J. Syst. Evol. Microbiol. 53, 1123-1126.
	Kim, J., Chun, J., Han, H.U., 2000. Leuconostoc kimchii sp. nov., a new species from kimchi. Int. J. Syst. Evol. Microbiol. 50, 1915-1919.	IMSNU 11154	Kim, J., Chun, J., Han, H.U., 2000. Leuconostoc kimchii sp. nov., a new species from kimchi. Int. J. Syst. Evol. Microbiol. 50, 1915-1919.
	Baroudi, A.A., 1976. Microorganisms and characteristics of laban. J Dairy Sci. 59, 200-2	ATCC 19256	Garvie, E.I., 1960. The genus Leuconostoc and its nomenclature. J. Dairy Res. 27, 283–292.
	Pedersen, C.S., 1962. Fermentation of the Yugoslavian pickled cabbage. Appl Microbiol. 10, 86-9. Lonvaud-Funel A. & Strasser de Saad A. M (1982): Purification and Properties of a Malolactic Enzyme from a Strain of Leuconostoc mesenteroides Isolated from Grapes, APPLIED AND ENVIRONMENTAL MICROBIOLOGY, vol. 43, No. 2, p 357-361 Mtshali P. S., Divol B. , du Toit M. (2012) PCR detection of enzyme-encoding genes in euconostoc mesenteroides strains of wine origin, World J Microbiol Biotechnol, V.28, p. 1443–1449	ATCC 8293	Van Tieghem, P.E.L., 1878. Sur la gomme de sucrerie. Ann. Sci. Nat. Bot., 6e Ser. 67, 180–202.
	Lazos, E.S., 1993. The fermentation of trahanas: a milk-wheat flour combination. Plant Foods Hum Nutr. 44, 45-62.	ATCC 8293	Garvie, E.I., 1983. Leuconostoc mesenteroides subsp. Cremoris (Knudsen and Sørensen) comb. nov. and Leuconostoc mesenteroides subsp. dextranicum Beijernick) comb. nov. Int. J. Syst. Bacteriol. 33, 118–119.
	Keenan, T.W., 1968. Production of acetic acid and other volatile compounds by Leucoostoc citrovorum and Leuconostoc dextranicum. Appl Microbiol. 16, 1881-5.	ATCC 19255	Garvie, E.I., 1983. Leuconostoc mesenteroides subsp. Cremoris (Knudsen and Sørensen) comb. nov. and Leuconostoc mesenteroides subsp. dextranicum Beijernick) comb. nov. Int. J. Syst. Bacteriol. 33, 118–119.
	Pedersen, C.S., 1962. Fermentation of the Yugoslavian pickled cabbage. Appl Microbiol. 10, 86-9. PEDERSON CS	ATCC 8293	Van Tieghem, P.E.L., 1878. Sur la gomme de sucrerie. Ann. Sci. Nat. Bot., 6e Ser. 67, 180–202.
	Ehrmann, M.A., Freiding, S., Vogel, R.F., 2009. Leuconostoc palmae sp. nov., a novel lactic acid bacterium isolated from palm wine. Int. J. Syst. Evol. Microbiol. 59, 943-947.	DSM 21144	Ehrmann, M.A., Freiding, S., Vogel, R.F., 2009. Leuconostoc palmae sp. nov., a novel lactic acid bacterium isolated from palm wine. Int. J. Syst. Evol. Microbiol. 59, 943-947.
	Pardo I. and Zuniga M 1992 Lactic Acid Bacteria in Spanish Red Rose and White Musts and Wines, JOURNAL OF FOOD SCIENCE, Vol. 57, No. 2, p. 392-395	DSMZ 20288	V. B. D. SKERMAN, VICKI McGOWAN, P. H. A. SNEATH 1980, International Journal of Systematic and Evolutionary Microbiology 30: 225-420

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Monera	Firmicutes	Leuconostocaceae	Leuconostoc	Leuconostoc pseudomes-ente-roides		Dairy
Monera	Firmicutes	Staphylococcaceae	Macrococcus	Macrococcus caseolyticus		Dairy, Meat
Monera	Firmicutes	Carnobacteriaceae	Marinilactibacillus	Marinilactibacillus psychrotolerans		Dairy
Monera	Actinobacteria	Microbacteriaceae	Microbacterium	Microbacterium foliorum		Dairy
Monera	Actinobacteria	Microbacteriaceae	Microbacterium	Microbacterium gubbeenense		Dairy
Monera	Actinobacteria	Micrococcaceae	Micrococcus	Micrococcus luteus		Dairy
Monera	Actinobacteria	Micrococcaceae	Micrococcus	Micrococcus lylae		Meat
Monera	Firmicutes	Leuconostocaceae	Oenococcus	Oenococcus oeni		Wine
Monera	Firmicutes	Lactobacillaceae	Pediococcus	Pediococcus acidilactici		Dairy, Meat
Monera	Firmicutes	Lactobacillaceae	Pediococcus	Pediococcus cerevisiae		Wine
Monera	Fimicutes	Lactobacillaceae	Pediococcus	Pediococcus damnosus		Beer, Wine

Reference Food Usage	Type Strain	Reference Taxonomy
Parente, E., Grieco, S., Crudele, M.A., 2001. Phenotypic diversity of lactic acid bacteria isolated from fermented sausages produced in Basilicata (Southern Italy). Journal of Applied Microbiology. 90, 943-52. Callon, C., Millet, L., Montel, M.C., 2004. Diversity of lactic acid bacteria isolated from AOC Salers cheese. Journal of Dairy Research 71, 231-44. Abriouel, H., Martín-Platero, A., Maqueda, M., Valdivia, E., Martínez-Bueno, M., 2008. Biodiversity of the microbial community in a Spanish farmhouse cheese as revealed by culture-dependent and culture-independent methods. International Journal of Food Microbiology 127, 200-8. Sengun, I.Y., Nielsen, D.S., Karapinar, M., Jakobsen, M., 2009. Identification of lactic acid bacteria isolated from Tarhana, a traditional Turkish fermented food. International Journal of Food Microbiology 135, 105-11.	ATCC 12291	Farrow, J.A.E., Facklam, R.R., Collins, M.D., 1989. Nucleic acid homologies of some vancomycin-resistant leuconostocs and description of Leuconostoc citreum sp. nov. and Leuconostoc pseudomesenteroides. Int. J. Syst. Bacteriol. 39, 279–283.
Bhowmik, T. Marth, E.H., 1990. Role of Micrococcus and Pediococcus species in cheese ripening. J. Dairy Sci 73, 859-866.	ATCC 13548	Kloos, W.E., Ballard, D.N., George, C.G.,Webster, J.A., Hubner, R.J., Ludwig, W., Schleifer, K.H., Fiedler, F. Schubert, K., 1998. Delimiting the genus Staphylococcus through description of Macrococcus caseolyticus gen. nov., comb. nov. and Macrococcus equipercicus sp. nov., Macrococcus bovicus sp. nov. and Macrococcus carouselicus sp. nov. Int. J. Syst. Bacteriol. 48, 859-877.
Ishikawa M, Kodama K, Yasuda H, Okamoto-Kainuma A, Koizumi K, Yamasato K. 2007. Presence of halophilic and alkaliphilic lactic acid bacteria in various cheeses. Lett Appl Microbiol. 44,308-13.	NCIMB13873 IAM14980 DSMZ19582 NBRC100002	Ishikawa M., Nakajima K., Yanagi M., Yamamoto Y. and Yamasato K. 2003. Marinilactibacillus psychrotolerans gen. nov., sp. nov., a halophilic and alkaliphilic marine lactic acid bacterium isolated from marine organisms in temperate and subtropical areas of Japan. Int. J. Syst. Evol. Microbiol. 53,711-720.
Deetae P, Bonnarme P, Spinnler HE, Helinck S. 2007. Production of volatile aroma compounds by bacterial strains isolated from different surface-ripened French cheeses. Appl Microbiol Biotechnol. 76,1161-71.	DSM 12966	Behrendt U., Ulrich A. and Schumann P. 2001. Description of Microbacterium foliorum sp. nov. and Microbacterium phyllosphaerae sp. nov., isolated from the phyllospheres of grasses and the surface litter after mulching the sward, and reclassification of Aureobacterium resistens (Funke et al. 1998) as Microbacterium resistens comb. nov. Int. J. Syst. Evol. Microbiol. 51,1267-1276.
Bockelmann, W., Willems, K.P., Neve, H., Heller, K.H., 2005. Cultures for the ripening of smear cheeses. International Dairy Journal 15, 719-732.	LMG S-19263	Brennan, N.M., Brown, R., Goodfellow, M., Ward, A.C., Beresford, T.P., Vancanneyt, M., Cogan, T.M., Fox, P.F., 2001. Microbacterium gubbeenense sp. nov., from the surface of a smear-ripened cheese. International Journal of Systematic and Evolutionary Microbiology 51, 1969-1976.
Bonnarme, P., Lapadatescu, C., Yvon, M., Spinnler, H.E., L-methionine degradation potentialities of cheese-ripening microorganisms. J Dairy Res. 68, 663-74.	ATCC 4698	Wieser, M., Denner, E.B.M., Kampfer, P., Schumann, P., Tindall, B., Steiner, U., Vybiral, D., Lubitz, W., Maszenan, A.M., Patel, B.K.C., Seviour, R.J., Radax, C., Busse, H.J., 2002. Emended descriptions of the genus Micrococcus, Micrococcus luteus (Cohn 1872) and Micrococcus lylae (Kloos et al. 1974). Int. J. Syst. Evol. Microbiol.52, 629-637
García Fontán, M.C., 2007. Microbiological characteristics of ""androlla"", a Spanish traditional pork sausage. Food Microbiol. 24, 52-8.	ATCC 27566	Wieser, M., Denner, E.B.M., Kampfer, P., Schumann, P., Tindall, B., Steiner, U., Vybiral, D., Lubitz, W., Maszenan, A.M., Patel, B.K.C., Seviour, R.J., Radax, C., Busse, H.J., 2002. Emended descriptions of the genus Micrococcus, Micrococcus luteus (Cohn 1872) and Micrococcus lylae (Kloos et al. 1974). Int. J. Syst. Evol. Microbiol.52, 629-637
Edwards, C.G., 1989. Inducing malolactic fermentation in wines. Biotechnol Adv. 7, 333-60.	ATCC 23279	Dicks, L.M., 1995. Proposal to reclassify Leuconostoc oenos as Oenococcus oeni [corrig.] gen. nov., comb. nov. Int J Syst Bacteriol. 45, 395-7.
Leroy, F., 2006. Functional meat starter cultures for improved sausage fermentation. Int J Food Microbiol. 106, 270-85.	ATCC 33314	[Lindner, P., 1887. Über ein neues in Malzmaischen vorkommendes, milchsäurebildendes Ferment. Wochenschrift fur Brauerei 4, 437-440.]
Gordon J., Pilone, Ralph E., Kunkee, and Dinsmoor Webb A (1966): Chemical Characterization of Wines Fermented with Various Malo-lactic Bacteria, APPLIED MICROBIOLOGY, Vol. 14, No. 4, p. 608-615	DSMZ 20331 ATCC 29358	Skerman VB, et al. Approved lists of bacterial names. Int J Syst Bacteriol 30: 225-420, 1980.
Snauwaert, Isabel, Stragier Pieter, De Vuyst Luc and Vandamme Peter. 2015. Comparative genome analysis of Pediococcus damnosus LMG 28219, a strain well-adapted to the beer environment. BMC Genomics; 2015, 16, p1-12. Lonvaud-Funel A., Joyeux A. and Ledoux O. (1991): Specific enumeration of lactic acid bacteria in fermenting grape must and wine by colony hybridization with non-isotopic DNA Probes, Journal of Applied Bacteriology, Vol. 71, p. 501-509	DSMZ 20331 ATCC 29358	FEMS Microbiol Lett. 1990 Aug; 58(3):255-62. The phylogeny of Aerococcus and Pediococcus as determined by 16S rRNA sequence analysis: description of Tetragenococcus gen. nov. Collins MD, Williams AM, Wallbanks S.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Monera	Firmicutes	Lactobacillaceae	Pediococcus	Pediococcus inopinatus		Wine
Monera	Firmicutes	Lactobacillaceae	Pediococcus	Pediococcus parvulus		Wine
Monera	Fimicutes	Lactobacillaceae	Pediococcus	Pediococcus pentosaceus		Meat, Fish, Dairy, Beer, Wine, Fruit, Vegetable beverages
Monera	Actinobacteria	Propionibacteriaceae	Propionibacterium	Propionibacterium acidipropionici		Dairy, vegetable juice
Monera	Actinobacteria	Propionibacteriaceae	Propionibacterium	Propionibacterium freudenreichii	Propioni-bacterium freudenreichii subsp. freudenreichii	Dairy
Monera	Actinobacteria	Propionibacteriaceae	Propionibacterium	Propionibacterium freudenreichii	Propioni-bacterium freudenreichii subsp.shermanii	Dairy
Monera	Actinobacteria	Propionibacteriaceae	Propionibacterium	Propionibacterium jensenii		Dairy, vegetable juice
Monera	Actinobacteria	Propionibacteriaceae	Propionibacterium	Propionibacterium thoenii		Dairy
Monera	Proteobacteria	Pseudomonadaceae	Pseudomonas	Pseudomonas syringae		Various
Monera	Actinobacteria	Moraxellaceae	Psychrobacter	Psychrobacter cibarius		Dairy
Monera	Actinobacteria	Moraxellaceae	Psychrobacter	Psychrobacter celer		Dairy
Monera	Firmicutes	Staphylococcaceae	Staphylococcus	Staphylococcus carnosus	Staphylococcus carnosus subsp. utilis	Meat

	Reference Food Usage	Type Strain	Reference Taxonomy
	Dicks L.M.T. and Endo A. (2009)Taxonomic Status of Lactic Acid Bacteria in Wine and Key Characteristics to Differentiate Species, S. Afr. J. Enol. Vitic., Vol. 30, No. 1	DSMZ 20285 ATCC 49902	Validation list no. 25. Int. J. Syst. Bacteriol. 38: 220-222, 1988. Back W. Zur taxonomie der gattung Pediococcus. The phenotype and genotype limits of the types of Pediococcus previously identified together with the description of a new sub-race which is detrimental to beer quality: Pediococcus inopinatus. Brauwissenschaft 31: 237-250, 312-320, 336-343, 1978.
	Arevalo-Villena, M., Bartowsky, E.J., Capone, D., Sefton, M.A., 2010. Production of indole by wine-associated microorganisms under oenological conditions.Food Microbiol 27(5):685-90. C. G. Edwards, J. C. Peterson, T. D. Boylston, T. D. Vasile (1994): Interactions Between Leuconostoc oenos and Pediococcus spp. During Vinification of Red Wines, Am J Enol Vitic, Vol. 45, p. 49-55	ATCC 19371	Gunther, H.L., White, H.R., 1961. The cultural and physiological characters of the pediococci. J. Gen. Microbiol. 26:185-197.
	Leroy, F., 2006. Functional meat starter cultures for improved sausage fermentation. Int J Food Microbiol. 106, 270-85. Pavels Semjonovs and Peteris Zikmanis, 2008.Evaluation of novel lactose-positive and exopolysaccharideproducing strain of Pediococcus pentosaceus for fermented foods. European Food Research & Technology 227 Issue 3, p851-856. Rodriguez A. V. and Manca de Nadra M. C. (1994): Sugar and organic acid metabolism in mixed cultures of Pediococcus pentosaceus and Leuconostoc oenos isolated from wine, Journal of Applied Bacteriology, Journal of Applied Bacteriology, vol. 77, p. 61-66. Lui H.C. & Lui S.S.T. 1981 Effects of malo-lactic fermentative bacteria on the acidity of white wine, Taiwania, Vol. 26. Paludan-Müller, C., 1999. Characterization of lactic acid bacteria isolated from a Thai low-salt fermented fish product and the role of garlic as substrate for fermentation. Int J Food Microbiol. 46, 219-29.	ATCC 33316	Mees, R.H., 1934. Onderzoekingen over de Biersarcina. Thesis. Technical University Delft, Holland, pp. 1-110.]
	Sherman, J.M., 1921. The cause of eyes and characteristic flavor of Emmental cheese. J. Bact. 6, 379-392. Warminska-Radyko, I.; Laniewska-Trokenheim, L.; Gerlich, J. 2006. Fermented multi-vegetable juices supplemented with Propionibacterium cell biomass / Fermentowane soki wielowarzywne suplementowane biomasa komorek Propionibacterium.Polish Journal of Food and Nutrition Sciences (Poland). 2006. v. 15/56(4) p. 433-436	ATCC 25562	Orla-Jensen, S., 1909. Die Hauptlinien des natürlichen Bakteriensystems. Zb. Bakteriol., Abt. 2 22, 305-346.
	Van Niel, 1928. The genus Propionibacterium. J.W. Boisevain, Haarlem, the Netherlands.	ATCC 6207	Moore, W.E.C., Holdeman, L.V., 1974. Propionibacterium. In: Buchanan, R.E., Gibbons, N.E. (Eds.), Bergey's Manual of Determinative Bacteriology, 8th ed. Williams & Wilkins. Baltimore, MD. 633–644.
	Van Niel, 1928. The genus Propionibacterium. J.W. Boisevain, Haarlem, the Netherlands.	ATCC 9614	Moore, W.E.C., Holdeman, L.V., 1974. Propionibacterium. In: Buchanan, R.E., Gibbons, N.E. (Eds.), Bergey's Manual of Determinative Bacteriology, 8th ed. Williams & Wilkins. Baltimore, MD. 633–644.
	Van Niel, 1928. The genus Propionibacterium. J.W. Boisevain, Haarlem, the Netherlands. Warminska-Radyko, I.; Laniewska-Trokenheim, L.; Gerlich, J. 2006. Fermented multi-vegetable juices supplemented with Propionibacterium cell biomass / Fermentowane soki wielowarzywne suplementowane biomasa komorek Propionibacterium.Polish Journal of Food and Nutrition Sciences 2006. v. 15/56(4) p. 433-436	DSM 20535	Britz, T.J., Riedel, K.H., 1994. Propionibacterium species diversity in Leerdammer cheese. Int J Food Microbiol. 22, 257-67.
	Van Niel, 1928. The genus Propionibacterium. J.W. Boisevain, Haarlem, the Netherlands.	NCFB568	Britz, T.J., Riedel, K-H.J., 1991. A numerical taxonomic study of Propionibacterium strains from dairy sources. Journal of Applied Microbiology 71, 407–416.
	Li, J., Izquierdo, M. P. and Lee, T.-C. (1997), Effects of ice-nucleation active bacteria on the freezing of some model food systems. International Journal of Food Science & Technology, 32: 41–49. doi:10.1046/j.1365-2621.1997.00380.x	DSM-10604, DSM-6693	Anzai, Y; Kim, H; Park, JY; Wakabayashi, H; Oyaizu, H (2000). "Phylogenetic affiliation of the pseudomonads based on 16S rRNA sequence". International Journal of Systematic and Evolutionary Microbiology. 50 (4): 1563–89
	Feligini M, Panelli S, Buffoni JN, Bonacina C, Andrighetto C, Lombardi A, 2012. Identification of microbiota present on the surface of Taleggio cheese using PCR-DGGE and RAPD-PCR. J Food Sci. 77(11):M609-15	DSM16327	JUNG (S.Y.), LEE (M.H.), OH (T.K.), PARK (Y.H.) and YOON (J.H.) Psychrobacter cibarius sp. nov., isolated from jeotgal, a traditional Korean fermented seafood. Int. J. Syst. Evol. Microbiol., 2005, 55, 577-582.
	Irlinger F, Yung SA, Sarthou AS, Delbès-Paus C, Montel MC, Coton E, Coton M, Helinck S., 2012. Ecological and aromatic impact of two Gram-negative bacteria (Psychrobacter celer and Hafnia alvei) inoculated as part of the whole microbial community of an experimental smear soft cheese. Int J Food Microbiol. 153(3):332-8.	JCM12601	YOON (J.H.), LEE (C.H.), KANG (S.J.) and OH (T.K.): Psychrobacter celer sp. nov., isolated from sea water of the South Sea in Korea. Int. J. Syst. Evol. Microbiol., 2005, 55, 1885-1890.
	Marchesini, B., 1992. Microbiological events during commercial meat fermentations. J Appl Bacteriol. 73, 203-9.	DSM 11676	Probst, A.J., Hertel, C., Richter, L., Wassill, L., Ludwig, W., Hammes, W.P., 1998. Staphylococcus condimenti sp. nov., from soy sauce mash, and Staphylococcus carnosus (Schleifer and Fischer 1982) subsp. utilis subsp. nov. Int. J. Syst. Bacteriol. 48, 651-658.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Monera	Firmicutes	Staphylococcaceae	Staphylococcus	Staphylococcus carnosus	Staphylococcus carnosus subsp. carnosus	Meat
Monera	Firmicutes	Staphylococcaceae	Staphylococcus	Staphylococcus cohnii		Dairy, Meat
Monera	Firmicutes	Staphylococcaceae	Staphylococcus	Staphylococcus condimenti		Soy
Monera	Firmicutes	Staphylococcaceae	Staphylococcus	Staphylococcus equorum	Staphylococcus equorum subsp. equorum	Dairy, Meat
Monera	Firmicutes	Staphylococcaceae	Staphylococcus	Staphylococcus equorum	Staphylococcus equorum subsp. linens	Dairy
Monera	Firmicutes	Staphylococcaceae	Staphylococcus	Staphylococcus fleurettii		Dairy
Monera	Firmicutes	Staphylococcaceae	Staphylococcus	Staphylococcus piscifermentans		Fish
Monera	Firmicutes	Staphylococcaceae	Staphylococcus	Staphylococcus saprophyticus		Meat
Monera	Firmicutes	Staphylococcaceae	Staphylococcus	Staphylococcus sciuri	Staphylococcus sciuri subsp. sciuri	Dairy
Monera	Firmicutes	Staphylococcaceae	Staphylococcus	Staphylococcus succinus	Staphylococcus succinus subsp. casei	Dairy
Monera	Firmicutes	Staphylococcaceae	Staphylococcus	Staphylococcus succinus	Staphylococcus succinus subsp succinus	Meat
Monera	Firmicutes	Staphylococcaceae	Staphylococcus	Staphylococcus vitulinus		Dairy, Meat
Monera	Firmicutes	Staphylococcaceae	Staphylococcus	Staphylococcus warneri		Meat

	Reference Food Usage	Type Strain	Reference Taxonomy
	Marchesini, B., 1992. Microbiological events during commercial meat fermentations. J Appl Bacteriol. 73, 203-9.	ATCC 51365	Probst, A.J., Hertel, C., Richter, L., Wassill, L., Ludwig, W., Hammes, W.P., 1998. Staphylococcus condimenti sp. nov., from soy sauce mash, and Staphylococcus carnosus (Schleifer and Fischer 1982) subsp. utilis subsp. nov. Int. J. Syst. Bacteriol. 48, 651-658.
	Deetae, P., 2007. Production of volatile aroma compounds by bacterial strains isolated from different surface-ripened French cheeses. Appl Microbiol Biotechnol. 76(5):1161-71. Drosinos, E.H., 2007. Phenotypic and technological diversity of lactic acid bacteria and staphylococci isolated from traditionally fermented sausages in southern Greece. Food Microbiol. 24(3):260-70.	ATCC 29974	Schleifer, K.H., Kloos, W.E., 1975. Isolation and characterization of staphylococci from human skin. I. Amended descriptions of Staphylococcus epidermidis and Staphylococcus saprophyticus,and descriptions of three new species: Staphylococcus cohnii, Staphylococcus haem, and Staphylococcus xylosus. Int. J. Syst. Bacteriol. 25:50-61.
	Probst, A.J., Hertel, C., Richter, L., Wassill, L., Ludwig, W., Hammes, W.P., 1998. Staphylococcus condimenti sp. nov., from soy sauce mash, and Staphylococcus carnosus (Schleifer and Fischer 1982) subsp. utilis subsp. nov. Int. J. Syst. Bacteriol. 48, 651-658.	DSM 11674	Probst, A.J., Hertel, C., Richter, L., Wassill, L., Ludwig, W., Hammes, W.P., 1998. Staphylococcus condimenti sp. nov., from soy sauce mash, and Staphylococcus carnosus (Schleifer and Fischer 1982) subsp. utilis subsp. nov. Int. J. Syst. Bacteriol. 48, 651-658.
	Schlafmann, K., Meusburger, A.P., Hammes, W.P., Braun, C., Fischer, A., Hertel, C., 2002. Starterkulturen zur Verbesserung der Qualität von Rohschinken. Fleischwirtschaft 11, 108-114. Carnio, M., Höltzel, A., Rudolf, M., Henle, T., Jung, G., Scherer, S., 2000. The Macrocyclic Peptide Antibiotic Micrococcin P1 Is Secreted by the Food-Borne Bacterium Staphylococcus equorum WS 2733 and Inhibits Listeria monocytogenes on Soft Cheese. Appl Environ Microbiol. 66, 2378–2384.	DSM 20674	Schleifer, K.H., Kilpper-Bälz, R., Devriese, L.A., 1985. Staphylococcus arlettae sp. nov., S. equorum sp. nov. and S. kloosii sp. nov.: three new coagulase-negative, novobiocin-resistant species from animals. Syst. Appl. Microbiol. 5, 501-509.
	Place, R.B., Hiestand, D., Gallmann, H.R., Teuber, M., 2003. Staphylococcus equorum subsp. linens, subsp. nov., a starter culture component for surface ripened semi-hard cheeses. Syst. Appl. Microbiol. 26, 30-37.	DSM 15097	Place, R.B., Hiestand, D., Gallmann, H.R., Teuber, M., 2003. Staphylococcus equorum subsp. linens, subsp. nov., a starter culture component for surface ripened semi-hard cheeses. Syst. Appl. Microbiol. 26, 30-37.
	Vernozy-Rozand, C., Mazuy, ., Meugnier, H., Bes, M., Lasne, Y., Fiedler, F., Etienne, J., Freney, J., 2000. Staphylococcus fleurettii sp. nov., isolated from goat's milk cheeses. Int. J. Syst. Evol. Microbiol. 50, 1521-1527.	CIP 106114	Vernozy-Rozand, C., Mazuy, ., Meugnier, H., Bes, M., Lasne, Y., Fiedler, F., Etienne, J., Freney, J., 2000. Staphylococcus fleurettii sp. nov., isolated from goat's milk cheeses. Int. J. Syst. Evol. Microbiol. 50, 1521-1527.
	Tanasupawat, S., Hashimoto, Y., Ezaki, T., Kozaki, M., Komagata, K., 1992. Staphylococcus piscifermentans sp. nov., from fermented fish in Thailand. Int. J. Syst. Bacteriol. 42, 577-581.	NRIC 1817	Tanasupawat, S., Hashimoto, Y., Ezaki, T., Kozaki, M., Komagata, K., 1992. Staphylococcus piscifermentans sp. nov., from fermented fish in Thailand. Int. J. Syst. Bacteriol. 42, 577-581.
	Kaban, G.J., 2008. Identification of lactic acid bacteria and Gram-positive catalase-positive cocci isolated from naturally fermented sausage (sucuk). Food Sci. 73(8):M385-8.	ATCC 15305	(Fairbrother 1940) Shaw, C., Stitt, M., Cowan, S.T., 1951. Staphylococci and their classification. J. Gen. Microbiol. 5: 1010-1023.
	O'Halloran, R., 1998. Purification of an extracellular proteinase from Staphylococcus sciuri found on the surface of Tilsit cheese.Biochem Soc Trans. 26, S29. O'Halloran R	ATCC 29062	Kloos, W.E., Schleifer, K.H., Smith, R.F., 1976. Characterization of Staphylococcus sciuri sp. nov. and its subspecies. International Journal of Systematic Bacteriology 26, 22-37.
	Place, R.B., Hiestand, D., Burri, S., Teuber, M., 2002. Staphylococcus succinus subsp. casei subsp. nov., a dominant isolate from a surface ripened cheese. Systematic and Applied Microbiology 25, 353-9.	DSM 15096	Place, R.B., Hiestand, D., Burri, S., Teuber, M., 2002. Staphylococcus succinus subsp. casei subsp. nov., a dominant isolate from a surface ripened cheese. Systematic and Applied Microbiology 25, 353-9.
	Talon, R., Leroy, S., Lebert, I., Giammarinaro, P., Chacornac, J.P., Latorre-Moratalla, M., Vidal-Carou, C., Zanardi, E., Conter, M., Lebecque, A., 2008. Safety improvement and preservation of typical sensory qualities of traditional dry fermented sausages using autochthonous starter cultures. International Journal of Food Microbiology 126, 227-34. Villani, F., Casaburi, A., Pennacchia, C., Filosa, L., Russo, F., Ercolini, D., 2008. Microbial ecology of the soppressata of Vallo di Diano, a traditional dry fermented sausage from southern Italy, and in vitro and in situ selection of autochthonous starter cultures. Applied and Environmental Microbiology 73, 5453-63.	ATCC 700337	Lambert, L.H., Cox, T., Mitchell, K., Rosselló-Mora, R.A., Del Cueto, C., Dodge, D.E., Orkand, P., Cano, R.J., 1998. Staphylococcus succinus sp. nov., isolated from Dominican amber. Int J Syst Bacteriol. 48 Pt 2:511-8.
	Bannerman, J.A., Hubner, R.J., Ballard, D.N., Cole, E.M., Bruce, J.L., Fiedler, F., Schubert, K., Kloos, W.E., 1994. Identification of the Staphylococcus sciuri species group with EcoRI fragments containing rRNA sequences and description of Staphylococcus vitulus sp. nov. Int. J. Syst. Bacteriol. 44, 454-460.	ATCC 51145	Bannerman, J.A., Hubner, R.J., Ballard, D.N., Cole, E.M., Bruce, J.L., Fiedler, F., Schubert, K., Kloos, W.E., 1994. Identification of the Staphylococcus sciuri species group with EcoRI fragments containing rRNA sequences and description of Staphylococcus vitulus sp. nov. Int. J. Syst. Bacteriol. 44, 454-460.
	Corbière Morot-Bizot, S., 2006. Staphylococcal community of a small unit manufacturing traditional dry fermented sausages. Int J Food Microbiol. 108, 210-7.	ATCC 2783	Kloos, W.E., Schleifer, K.H., 1975. Isolation and characterization of staphylococci from human skin. II. Description of four new species: Staphylococcus warneri, Staphylococcus capitis, Staphylococcus hominis, and Staphylococcus simulans. International Journal of Systematic Bacteriology 25, 62-79.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Monera	Firmicutes	Staphylococcaceae	Staphylococcus	Staphylococcus xylosus		Dairy, Meat
Monera	Firmicutes	Streptococcaceae	Streptococcus	Streptococcus gallolyticus	Streptococcus gallolyticus subsp. macedonicus	Dairy
Monera	Firmicutes	Streptococaceae	Streptococcus	Streptococcus salivarius	Streptococcus salivarius subsp. thermophilus	Dairy
Monera	Firmicutes	Streptococaceae	Streptococcus	Streptococcus salivarius	Streptococcus salivarius subsp. salivarius	Soy, Vegetables
Monera	Actinobacteria	Streptomycetaceae	Streptomyces	Streptomyces griseus	Streptomyces griseus subsp. griseus	Meat
Monera	Firmicutes	Enterococcaceae	Tetragenococcus	Tetragenococcus halophilus		Soy
Monera	Firmicutes	Enterococcaceae	Tetragenococcus	Tetragenococcus koreensis		Vegetables
Monera	Firmicutes	Leuconostocaceae	Weissella	Weissella beninensis		Vegetables
Monera	Firmicutes	Leuconostocaceae	Weissella	Weissella cibaria		Vegetables
Monera	Firmicutes	Leuconostocaceae	Weissella	Weissella confusa		Sourdough Wine
Monera	Firmicutes	Leuconostocaceae	Weissella	Weissella fabaria		Cocoa
Monera	Firmicutes	Leuconostocaceae	Weissella	Weissella ghanensis		Cocoa
Monera	Firmicutes	Leuconostocaceae	Weissella	Weissella hellenica		Meat
Monera	Firmicutes	Leuconostocaceae	Weissella	Weissella koreensis		Vegetables

	Reference Food Usage	Type Strain	Reference Taxonomy
	Corbière Morot-Bizot, S., 2006. Staphylococcal community of a small unit manufacturing traditional dry fermented sausages. Int J Food Microbiol. 108, 210-7.	ATCC 29971	Schleifer, K.H., Kloos, W.E., 1975. Isolation and characterization of staphylococci from human skin. I. Amended descriptions of Staphylococcus epidermidis and Staphylococcus saprophyticus and descriptions of three new species: Staphylococcus cohnii, Staphylococcus haemolyticus, and Staphylococcus xylosus. International Journal of Systematic Bacteriology 25, 50-61.
	Georgalaki, M.D.,Sarantinopoulos, P., Ferreira, E.S., De Vuyst, L., Kalantzopoulos, G., Tsakalidou, E., 2000. Biochemical properties of Streptococcus macedonicus strains isolated from Greek Kasseri cheese. Journal of Applied Microbiology 88, 817-25.	ATCC BAA249	Tsakalidou, E., 1998. Identification of streptococci from Greek Kasseri cheese and description of Streptococcus macedonicus sp. nov. Int J Syst Bacteriol. 48 Pt 2, 519-27.
	Sherman, J.M., Stark, P., 1938. The Fermentation of Disaccharides by Streptococcus thermophilus. J Bacteriol. 36, 77-81.	ATCC 19258	Orla-Jensen, S. 1924. La classification des bactéries lactiques. Lait 4, 468–474.
	Ongol, M.P., Asano, K., 2009. Main microorganisms involved in the fermentation of Ugandan ghee. Int J Food Microbiol. 133, 286-91. Chun, J., Kim, G.M., Lee, K., Choi, I.D., Kwon, G.H., Park, J.Y., Jeong, S.J., Kim, J.S., Kim, J.H., 2007. Conversion of Isoflavone Glucosides to Aglycones in Soymilk by Fermentation with Lactic Acid Bacteria. J Food Science 72(2) M39-44	ATCC 7073	Andrewes, F.W., Horder, T.J., 1906. A study of the streptococci pathogenic for man. Lancet ii:708-713.
	Hammes, W.P., Knauf, H.J., 1994. Starter in the processing of meat products. Meat Science 36, 155-168. Candogan, K., Wardlaw, F.B., Acton, J.C., 2009. Effect of starter cultures on proteolytic changes during processing. Food Chemistry 116, 731-737.	ATCC 23345	Waksman, S.A., Henrici, A.T., 1943. The nomenclature and classification of the actinomycetes. J. Bacteriol. 46, 337–341.
	Noda, F., Hayashi, K., Mizunuma, T., 1980. Antagonism Between Osmophilic Lactic Acid Bacteria and Yeasts in Brine Fermentation of Soy Sauce. Appl Environ Microbiol. 40, 452-457. Nishimura, I., Igarashi, T., Enomoto, T., Dake, Y., Okuno, Y., Obata, A., 2009. Clinical efficacy of halophilic lactic acid bacterium Tetragenococcus halophilus Th221 from soy sauce moromi for perennial allergic rhinitis. Allergol Int. 58:179-85.	ATCC 33315	Anon., 1994. Validation of the Publication of New Names and New Combinations Previously Effectively Published Outside the IJSB List No. 49. Int. J. Syst. Bacteriol. 44: 370 - 371 Collins, M.D., Williams, A.M., Wallbanks, S., 1990. The phylogeny of Aerococcus and Pediococcus as determined by 16S rRNA sequence analysis: description of Tetragenococcus gen. nov. FEMS Microbiol Lett. 58, 255-62.
	Lee, M., Kim, M.K., Vancanneyt, M., Swings, J. Kim, S.H., Kang,. M.S., Lee, S.T., 2005. Tetragenococcus koreensis sp. nov., a novel rhamnolipid-producing bacterium. Int. J. Syst. Evol. Microbiol. 55, 1409-1413.	DSM 16501	Lee, M., Kim, M.K., Vancanneyt, M., Swings, J. Kim, S.H., Kang,. M.S., Lee, S.T., 2005. Tetragenococcus koreensis sp. nov., a novel rhamnolipid-producing bacterium. Int. J. Syst. Evol. Microbiol. 55, 1409-1413.
	Padonou, S.W., Schillinger, U., Nielsen, D.S., Franz, C.M.A.P., Hansen, M., Hounhouigan, J.D., Nago, M.C., Jakobsen, M., 2010. Weissella beninensis sp. nov., a motile lactic acid bacterium from submerged cassava fermentations, and emended description of the genus Weissella. Int. J. Syst. Evol. Microbiol. 60, 2193-2198.	DSM 22752	Padonou, S.W., Schillinger, U., Nielsen, D.S., Franz, C.M.A.P., Hansen, M., Hounhouigan, J.D., Nago, M.C., Jakobsen, M., 2010. Weissella beninensis sp. nov., a motile lactic acid bacterium from submerged cassava fermentations, and emended description of the genus Weissella. Int. J. Syst. Evol. Microbiol. 60, 2193-2198.
	Björkroth, K.J., Schillinger, U., Geisen, R., Weiss, N., Hoste, B., Holzapfel, W.H., Korkeala, H.J., Vandamme, P., 2002. Taxonomic study of Weissella confusa and description of Weissella cibaria sp. nov., detected in food and clinical samples. Int. J. Syst. Evol. Microbiol. 52, 141-148.	LMG 17699	Björkroth, K.J., Schillinger, U., Geisen, R., Weiss, N., Hoste, B., Holzapfel, W.H., Korkeala, H.J., Vandamme, P., 2002. Taxonomic study of Weissella confusa and description of Weissella cibaria sp. nov., detected in food and clinical samples. Int. J. Syst. Evol. Microbiol. 52, 141-148.
	Katina, K., 2009. In situ production and analysis of Weissella confusa dextran in wheat sourdough. Food Microbiol. 26(7):734-43. Pardo I. and Zuniga M 1992 Lactic Acid Bacteria in Spanish Red Rose and White Musts and Wines, JOURNAL OF FOOD SCIENCE, Vol. 57, No. 2, p. 392-396	LMG 17699	Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S., 1993. Taxonomic studies on some Leuconostoc-like organisms from fermented sausages: description of a new genus Weissella for the Leuconostoc paramesenteroides group of species. J. Appl. Bacteriol. 75, 595-603. https://www.dsmz.de/catalogues/details/culture/DSM-20196.html
	De Bruyne, K., Camu, N., De Vuyst, L., Vandamme, P., 2010. Weissella fabaria sp. nov., from a Ghanaian cocoa fermentation. Int. J. Syst. Evol. Microbiol. 60, 1999-2005.	DSM 21416	De Bruyne, K., Camu, N., De Vuyst, L., Vandamme, P., 2010. Weissella fabaria sp. nov., from a Ghanaian cocoa fermentation. Int. J. Syst. Evol. Microbiol. 60, 1999-2005.
	De Bruyne, K., Camu, N., Lefebvre, K., De Vuyst, L., Vandamme, P., 2008. Weissella ghanensis sp. nov., isolated from a Ghanaian cocoa fermentation. Int. J. Syst. Evol. Microbiol. 58, 2721-2725.	LMG 24286	De Bruyne, K., Camu, N., Lefebvre, K., De Vuyst, L., Vandamme, P., 2008. Weissella ghanensis sp. nov., isolated from a Ghanaian cocoa fermentation. Int. J. Syst. Evol. Microbiol. 58, 2721-2725.
	Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S., 1993. Taxonomic studies on some Leuconostoc-like organisms from fermented sausages: description of a new genus Weissella for the Leuconostoc paramesenteroides group of species. J. Appl. Bacteriol. 75, 595-603.	DSM 7378	Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S., 1993. Taxonomic studies on some Leuconostoc-like organisms from fermented sausages: description of a new genus Weissella for the Leuconostoc paramesenteroides group of species. J. Appl. Bacteriol. 75, 595-603.
	Lee J.S., Lee, K.C., Ahn, J.S., Mheen, T.I., Pyun, Y.R., Park, Y.H., 2002. Weissella koreensis sp. nov., isolated from kimchi. Int. J. Syst. Evol. Microbiol. 52, 1257-1261.	KCTC 3621	Lee J.S., Lee, K.C., Ahn, J.S., Mheen, T.I., Pyun, Y.R., Park, Y.H., 2002. Weissella koreensis sp. nov., isolated from kimchi. Int. J. Syst. Evol. Microbiol. 52, 1257-1261.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Monera	Firmicutes	Leuconostocaceae	Weissella	Weissella paramesenteroides		Meat
Monera	Firmicutes	Leuconostocaceae	Weissella	Weissella thailandensis		Fish
Monera	Proteobacteria	Sphingomonadaceae	Zymomonas	Zymomonas mobilis	Zymomonas mobilis subsp. mobilis	Beverages
Fungi	Zygomycota	Mucoracea	Actinomrcor	Actinomrcor elegans		Sufu
Fungi	Ascomycota	Debaryomycetaceae	Candida	Candida mogii		Soy sauce
Fungi	Ascomycota	Debaryomycetaceae	Meyerozyma	Meyerozyma guilliermondii		Soy sauce
Fungi	Zygomycota	Mucoracea	Mucor	Mucor circinelloides		Sufu
Fungi	Zygomycota	Mucoracea	Mucor	Mucor flavus		Sufu
Fungi	Ascomycota	Saccharomycetaceae	Zygosaccharomyces	Zygosaccharomyces bisporus		Vinegar
Fungi	Ascomycota	Trichocomaceae	Aspergillus	Aspergillus luchuensis		Tea
Fungi	Ascomycota	Trichocomaceae	Aspergillus	Aspergillus niger		Beverages
Fungi	Ascomycota	Trichocomaceae	Aspergillus	Aspergillus oryzae		Soy, Beverages
Fungi	Ascomycota	Trichocomaceae	Aspergillus	Aspergillus sojae		Soy
Fungi	Ascomycota	Saccharomycetaceae	Candida	Candida etchellsii		Dairy, Soy, Vegetables
Fungi	Ascomycota	Saccharomycetaceae	Candida	Candida famata		Wine

	Reference Food Usage	Type Strain	Reference Taxonomy
	Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S., 1993. Taxonomic studies on some Leuconostoc-like organisms from fermented sausages: description of a new genus Weissella for the Leuconostoc paramesenteroides group of species. J. Appl. Bacteriol. 75, 595-603.	ATCC 33313	Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S., 1993. Taxonomic studies on some Leuconostoc-like organisms from fermented sausages: description of a new genus Weissella for the Leuconostoc paramesenteroides group of species. J. Appl. Bacteriol. 75, 595-603.
	Tanasupawat, S., Shida, O., Okada, S., Komagata, K., 2000. Lactobacillus acidipiscis sp. nov. and Weissella thailandensis sp. nov., isolated from fermented fish in Thailand. International Journal of Systematic and Evolutionary Microbiology 50, 1479-85.	JCM 10695	Tanasupawat, S., Shida, O., Okada, S., Komagata, K., 2000. Lactobacillus acidipiscis sp. nov. and Weissella thailandensis sp. nov., isolated from fermented fish in Thailand. International Journal of Systematic and Evolutionary Microbiology 50, 1479-85.
	Rogers, P.L., Goodman, A.E., Heyes, R.H., 1984. Zymomonas ethanol fermentations. Microbiol Sci. 1, 133-6.	ATCC 10988	Swings, J., De Ley, J., 1977. The biology of Zymomonas. Bacteriol Rev. 41, 1-46.
	Lu J M, Yu R C, Cheng C C. Purification and Some Properties of Glutaminase from A ctinomucor taiwanensis, Starter of Sufu[J]. Journal of the Science of Food & Agriculture, 1996, 70(4):509–514.	ATCC 22814	Walther, G., Pawłowska, J., Alastruey-Izquierdo, A., Wrzosek, M.,Rodriguez- Tudela, J. L., & Dolatabadi, S., et al. . DNA barcoding in mucorales: an inventory of biodiversity. Persoonia - Molecular Phylogeny and Evolution of Fungi,2013,30(3), 11-47.
	Chen, X., Yan, M., Xie, F., Dai, J., Li, D., & Wang, Z., et al. (2014). Biotin enhances salt tolerance of torulopsis mogii. Annals of Microbiology, 65(1), 393-398.	CBS 5713	Kurtzman CP, Fell JW, Boekhout T, Robert V (2011) Methods for isolation, phenotypic characterization and maintenance of yeasts. In: Fell JW, Boekhout T (eds) The Yeasts, A Taxonomic Study (Kurtzman CP, 5th edn. Elsevier, Amsterdam, pp 987-1278.
	Thin Thin W, Supawan W, Apinya A, et al. Co-culturing of Pichia guilliermondii enhanced volatile flavor compound formation by Zygosaccharomyces rouxii in the model system of Thai soy sauce fermentation.[J]. International Journal of Food Microbiology, 2013, 160(3):282-9.	CBS 2030	CP Kurtzman, M Suzuk. Phylogenetic analysis of ascomycete yeasts that form coenzyme Q-9 and the proposalof the new genera Babjeviella, Meyerozyma, Millerozyma, Priceomyces, and Scheffersomyces. Mycoscience January 2010, Volume 51, Issue 1, pp 2-14
	Han, B. Z., Kuijpers, A. F. A., Thanh, N. V., & Nout, M. J. R. (2004). Mucoraceous moulds involved in the commercial fermentation of sufu pehtze. Antonie Van Leeuwenhoek, 85(3), 253-7.	CBS 195.68	Walther G, Pawlowska J, Alastruey-Izquierdo A, Wrzosek M, et al. DNA barcoding in Mucorales: an inventory of biodiversity. Persoonia,2013, 30, 11-47.
	Cheng Y Q, Hu Q, Li L T, et al. Production of sufu, a traditional Chinese fermented soybean food, by fermentation with Mucor flavus at low temperature.[J]. Food Science & Technology Research, 2009, 15(4):347-352.	CBS234.35	Walther G, Pawlowska J, Alastruey-Izquierdo A, Wrzosek M, et al. DNA barcoding in Mucorales: an inventory of biodiversity. Persoonia,2013, 30, 11-47.
	Solieri, L., & Giudici, P. (2008). Yeasts associated to traditional balsamic vinegar: ecological and technological features. International Journal of Food Microbiology, 125(1), 36-45.	CBS 702	Kurtzman CP, Fell JW, Boekhout T, Robert V (2011) Methods for isolation, phenotypic characterization and maintenance of yeasts. In: Fell JW, Boekhout T (eds) The Yeasts, A Taxonomic Study (Kurtzman CP, 5th edn. Elsevier, Amsterdam, pp 937-947.
	Mogensen, J.M., Varga J., Thrane, U., Frisvad, J.C., 2009. Aspergillus acidus from Puerh tea and black tea does not produce ochratoxin A and fumonisin B2. Int. J. Food Microbiol. 132, 141-144.	CBS 56465	Seung-Beom Hong, OsamuYamada, Robert A. Samson. (2014) Taxonomic re-evaluation of black koji molds. Appl Microbiol Biotechnol, 98:555–561.
	Nout, R., 2000. Useful role of of fungi in food processing. In: Samson, R.A., Hoekstra, E.S., Frisvad, J.C., Filtenborg, O. (Eds.), Introduction to food- and airborne fungi. 6th ed. Centraalbureau voor Schimmelciultures, Utrecht.	CBS 51388	Accensi, F., Cano, J., Figuera, L., Abarca, M.L., Cabañes, F.J., 1999. New PCR method to differentiate species in the Aspergillus niger aggregate. FEMS Microbiol Lett. 180, 191-6.
	Bhumiratana, A., Flegel, T.W., Glinsukon, T., Somporan, W., 1980. Isolation and analysis of molds from soy sauce koji in Thailand. Appl Environ Microbiol. 39, 430-5. Miyake, Y., Ito, C., Itoigawa, M., Osawa, T., 2007. Isolation of the Antioxidant Pyranonigrin-A from Rice Mold Starters Used in the Manufacturing Process of Fermented Foods. Biosci Biotechnol Biochem. 71, 2515-21. Barbesgaaard, P., Heldt-Hansen, H.P., Diderichsen, B., 1992. On the safety of aspergillus oryzae: a review. Appl Microbiol Biotechnol. 36, 569-572.	CBS 100925	Geiser, D.M, Pitt, J.I., Taylor, J.W., 1998. Cryptic speciation and recombination in the aflatoxin-producing fungus Aspergillus flavus. Proc Natl Acad Sci U S A. 95, 388-393.
	Miyake, Y., Ito, C., Itoigawa, M., Osawa, T., 2007. Isolation of the Antioxidant Pyranonigrin-A from Rice Mold Starters Used in the Manufacturing Process of Fermented Foods. Biosci Biotechnol Biochem. 71, 2515-21.	CBS 100928	Godet, M., Munaut, F., 2010. Molecular strategy for identification in Aspergillus section Flavi. FEMS Microbiol Lett. 304, 157-68.
	Coton E, Coton M, Levert D, Casaregola S, Sohier D, 2006. Yeast ecology in French cider and black olive natural fermentations. Int J Food Microbiol. Apr 15;108(1):130-5.	CBS 1750	Suezawa, Y., Kimura, I., Inoue, M., Gohda, N., Suzuki, M., 2006. Identification and typing of miso and soy sauce fermentation yeasts, Candida etchellsii and C. versatilis, based on sequence analyses of the D1D2 domain of the 26S ribosomal RNA gene, and the region of internal transcribed spacer 1, 5.8S ribosomal RNA gene and internal transcribed spacer 2. Biosci Biotechnol Biochem
	Charoenchai, C., Fleet, G.H., Henschke, P.A., Todd, B.E.N., 1997. Screening of non-Saccharomyces wine yeasts for the presence of extracellular hydrolytic enzymes, Australian Journal of Grape and Wine Research Vol. 3,p. 2-9	NBRC 0623 CBS 1795	Nguyen HV, Gaillardin C, Neuveglise C, 2009 Differentiation of Debaryomyces hansenii and Candida famata by rRNA gene intergenic spacer fingerprinting and reassessment of phylogenetic relationships among D. hansenii, C. famata, D. fabryi, C. flareri (=D. subglobosus) and D. prosopidis: description of D. vietnamensis sp. nov. closely related to D. nepalensis FEMS Yeast Res 9(4), 641-662

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Fungi	Ascomycota	Saccharomycetaceae	Candida	Candida intermedia		Dairy
Fungi	Ascomycota	Saccharomycetaceae	Candida	Candida krusei		Wine
Fungi	Ascomycota	Saccharomycetaceae	Candida	Candida milleri		Sourdough
Fungi	Ascomycota	Saccharomycetaceae	Candida	Candida oleophila		Wine
Fungi	Ascomycota	Saccharomycetaceae	Candida	Candida pulcherrima		Wine
Fungi	Ascomycota	Saccharomycetaceae	Candida	Candida rugosa		Dairy
Fungi	Ascomycota	Saccharomycetaceae	Saccharomyces	Candida saitoana		Vegetables
Fungi	Ascomycota	Saccharomycetaceae	Candida	Candida sake		Dairy, brewery
Fungi	Ascomycota	Saccharomycetaceae	Candida	Candida stellata		Wine
Fungi	Ascomycota	Saccharomycetaceae	Candida	Candida tropicalis		Vegetables
Fungi	Ascomycota	Saccharomycetaceae	Candida	Candida versatilis		Dairy, Soy
Fungi	Ascomycota	Saccharomycetaceae	Candida	Candida zemplinina		Wine
Fungi	Ascomycota	Saccharomycetaceae	Candida	Candida zeylanoides		Dairy
Fungi	Ascomycota	Saccharomycetaceae	Cyberlindnera	Cyberlindnera jadinii		Dairy
Fungi	Ascomycota	Saccharomycetaceae	Cyberlindnera	Cyberlindnera mrakii		Wine
Fungi	Basidiomycota	Cystofilobasidiaceae	Cystofilobasidium	Cystofilobasidium infirmominiatum		Dairy

	Reference Food Usage	Type Strain	Reference Taxonomy
	Nahabieh F. and Schmidt J.L. 1990. Study of the yeast flora composition of some wide varieties of goat cheese. Lait. 70, 325-343.	CBS572	Langeron, M.; Guerra, P. 1938. Nouvelles recherches de zymologie médicale. Annales de Parasitologie Humaine Comparée. 16(5):429-476
	Charoenchai, C., Fleet, G.H., Henschke, P.A., Todd, B.E.N., 1997. Screening of non-Saccharomyces wine yeasts for the presence of extracellular hydrolytic enzymes, Australian Journal of Grape and Wine Research Vol. 3,p. 2-9	MB#268707	Berkhout 1923, De schimmelgeslachten Monilia, Oidium, Oospora en Torula
	Valmorri, S., 2010. Yeast microbiota associated with spontaneous sourdough fermentations in the production of traditional wheat sourdough breads of the Abruzzo region (Italy). Antonie Van Leeuwenhoek 97(2):119-29.	ATCC 56464	Yarrow, D., 1978. Candida milleri sp. nov. Int J Syst Bacteriol 28, 608-610
	Droby, S., Cohen, L., Davis, A., Weiss, B., Hores, B., Chalutz, E., Kotz, H., Kerantzur, M., Shachnai, A., 1998. Commercial testing of Aspire: a yeast preparation for the biological control of postharvest decay of citrus. Biol. Control 12, 97-101	CBS 2219	Montrocher, R., 1967. [Quelques nouvelles espèces et variétés du genre Candida (Levures asporogènes)]. Rev Mycol 32 69-92
	Charoenchai, C., Fleet, G.H., Henschke, P.A., Todd, B.E.N., 1997. Screening of non-Saccharomyces wine yeasts for the presence of extracellular hydrolytic enzymes, Australian Journal of Grape and Wine Research Vol. 3,p. 2-9	MB#284777	Linder Windish, 1938, Archive für Mikrobiologie 9
	Seiler, H., Busse, M., 1990. The yeasts of cheese brines. Int J Food Microbiol. 11(3-4):289-303.	CBS 613	Diddens, H.A., Lodder, J., 1942. [Asporogenous Yeasts] Vol2 1-511
	Soni, S.K., Sandhu, D.K., Vikhu, K.S., Karma, N., 1986. Microbiological studies on dosa fermentation. Food Microbiol 3: 45–53.	CBS 940	C.P.KURTZMAN, J.W.FELL, T.BOEKHOUT. (2011) The Yeasts, a Taxonomic Study [M]. United States of America, FIFTH EDITION.
	Nahabieh F. and Schmidt J.L. 1990. Study of the yeast flora composition of some wide varieties of goat cheese. Lait. 70, 325-343.	CBS 159	Meyer, S.A.; Ahearn, D.G. 1983: Validation of the names of some Candida species. Mycotaxon 17: 297-298
	Charoenchai, C., Fleet, G.H., Henschke, P.A., Todd, B.E.N., 1997. Screening of non-Saccharomyces wine yeasts for the presence of extracellular hydrolytic enzymes, Australian Journal of Grape and Wine Research Vol. 3,p. 2-9	ATCC 10673 CBS 157	Candida stellata (Kroemer et Krumbholz) Meyer et Yarrow, anamorph
	Coulin, P., Farah, Z., Assanvo, J., Spillmann, H., Puhan, Z., 2006. Characterisation of the microflora of attiéké, a fermented cassava product, during traditional small-scale preparation. Int J Food Microbiol 106 131–6	ATCC 4563	Berkhout, C.M., 1923. De schimmelgeslachten Monilia, Oidium, Oospora en Torula: 44
	Seiler, H., Busse, M., 1990. The yeasts of cheese brines. Int J Food Microbiol. 11:289-303. van der Sluis, C., Mulder, A.N., Grolle, K.C., Engbers, G.H., ter Schure, E.G., Tramper, J., Wijffels, R.H., 2000. Immobilized soy-sauce yeasts: development and characterization of a new polyethylene-oxide support. J Biotechnol. 80:179-88. Suezawa ,Y., Suzuki, M., 2007. Bioconversion of Ferulic Acid to 4-Vinylguaiacol and 4-Ethylguaiacol and of 4-Vinylguaiacol to 4-Ethylguaiacol by Halotolerant Yeasts Belonging to the Genus Candida. Biosci Biotechnol Biochem. 71:1058-62	CBS 1752	Lodder, Kreger-van, R., 1984, The Yeast: a Taxonomie Study. p.831
	Urso, R., Rantsiou, K., Dolci, Rolle, L., Comi, G., Cocolin, L., 2008. Yeast biodiversity and dynamics during sweet wine production as determined by molecular methods. FEMS Yeast Res 8 1053–1062	CBS 9494	Sipiczki, M., 2003. Candida zemplinina sp. nov., an osmotolerant and psychrotolerant yeast that ferments sweet botrytized wines. Int J System Evol Microbiol 53: 2079–2083.
	Seiler H, Busse, M., 1990. The yeasts of cheese brines. Int. J. Food Microbiol., 11(3-4), 289-303	CBS 519	Tsui, T.H.M., Daniel, H.M., Robert, V., Meyer, W., 2008. Re-examining the phylogenyof clinically relevant Candida species and allied genera based on multigene analyses. FEMS Yeast Res 8 651–659 Kurtzman, C.P., Suzuki, M., 2010. Phylogenetic analysis of ascomycete yeasts that form coenzyme Q-9 and the proposal of the new genera Babjeviella, Meyerozyma, Millerozyma, Priceomyces, and Scheffersomyces. Mycoscience 51, 2-14
	Thrane, U., 2007. Fungal protein for food. In: Dijksterhuis, J., Samson, R.A. (Eds.), Food Mycology. A multifaceted approach to fungi and food. CRC Press, Boca Raton, pp. 353-360.	CBS 5609	Minter, D.W., 2009. Cyberlindnera, a replacement name for Lindnera Kurtzman et al., nom. illegit. Mycotaxon. 110, 473-476.
	Erten, H., Tanguler, H., 2010. Influence of Williopsis saturnus yeasts in combination with Saccharomyces cerevisiae on wine fermentation. Lett Appl Microbiol. 50, 474-9.	CBS 1707	Kurtzman, C.P., Robnett, C.J., 2010. Systematics of methanol assimilating yeasts and neighboring taxa from multigene sequence analysis and the proposal of Peterozyma gen. nov., a new member of the Saccharomycetales. FEMS Yeast Res. 10, 353-61.
	Early, R., 1998. The technology of dairy products. Springer.	CBS 323	Hamamoto, M., Sugiyama, J.,Komagata, K., 1988. Transfer of Rhodosporidium infirmominiatum to the genus Cystofilobasidium as Cystofilobasidium infirmominiatum comb. nov. J Gen Appl Microbiol 34, 271–278.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Fungi	Ascomycota	Saccharomycetaceae	Debaryomyces	Debaryomyces hansenii		Dairy, Meat, Fish, Vegetable
Fungi	Ascomycota	Saccharomycetaceae	Dekkera	Dekkera bruxellensis		Beverages
Fungi	Ascomycota	Saccharomycetaceae	Dekkera	Dekkera claussenii		Kombucha
Fungi	Ascomycota	Saccharomycetaceae	Diutina	Diutina catenulata		Dairy
Fungi	Ascomycota	Trichocomaceae	Eurotium	Eurotium cristatum		Fuzhuan brick Tea
Fungi	Ascomycota	Nectriaceae	Fusarium	Fusarium domesticum		Dairy
Fungi	Ascomycota	Nectriaceae	Fusarium	Fusarium venenatum		Dairy
Fungi	Ascomycota	Dipodascaceae	Galactomyces	Galactomyces candidum		Dairy
Fungi	Ascomycota	Dipodascaceae	Geotrichum	Geotrichum candidum		Dairy, Meat
Fungi	Basidiomycota	Cystofilobasidiaceae	Guehomyces	Guehomyces pullulans		Vegetables
Fungi	Ascomycota	Saccharomycetaceae	Hanseniaspora	Hanseniaspora guilliermondii		Wine
Fungi	Ascomycota	Saccharomycetaceae	Hanseniaspora	Hanseniaspora osmophila		Wine
Fungi	Ascomycota	Saccharomycetaceae	Hanseniaspora	Hanseniaspora uvarum		Wine

	Reference Food Usage	Type Strain	Reference Taxonomy
	Bartschi, C., Berthier, J., Valla, G., 1994. Besançon, X., Smet, C., Chabalier, C., Rivemale, M., Reverbel, J.P., Ratomahenina, R., Galzy, P., 1992. Besancon, X., Ratomahenina, R., Galzy, P., 1995. Hammes W.P. & Knauf H.J. 1994 Starters in the Processing of Meat Products. Meat Science 36 p 155-168. Saldanha-da-Gama A, Malfeito-Ferreira M., Loureiro V. 1997 Characterization of yeasts associated with Portuguese pork-based products. IJFM 37 p201-207 Guerzoni, M.E., Lanciotti, R., Marchetti, R. 1993. Survey of the physiological properties of the most frequent yeast associated with commercial chilled foods. IJFM 17, 329-341.	CBS 767	Jacques, N., Mallet, S., Casaregola, S., 2009. Delimitation of the species of the Debaryomyces hansenii complex by intron sequence analysis. Int J Syst Evol Microbiol. 59(Pt 5), 1242-51
	Boekhout, T., Robert, V. (Eds.), 2003. Yeasts in food: Beneficial and detrimental aspects. Behr's Verlag, Hamburg.	CBS 74	Walt, J.P. van der, 1964. Dekkera, a new genus of the Saccharomycetaceae. Antonie van Leeuwenhoek 30, 273-280.
	Jayabalan, R., Malbasa, R.V., Loncar, E.S., Vitas, J.S., and Sathishkumar, M., 2014. A Review on Kombucha Tea—Microbiology, Composition, Fermentation, Beneficial Effects, Toxicity, and Tea Fungus. Comprehensive Reviews in Food Science and Food Safety Vol. 13	ATCC 10562	"Roder C, Konig H, Frohlich J Species-specific identification of Dekkera/ Brettanomyces yeasts by fluorescently labeled DNA probes targeting the 26S rRNA FEMS Yeast Res 7(6), 1013-1026, 2007"
	- Roostita, R., Fleet, G.H. 1996. The occurrence and growth of yeasts in Camembert and blue-veined cheeses. Int. J. Food Microbiol. Vol 28. 393-404	CBS 565	Khunnamwong, P., Lertwattanasakul, N., Jindamorakot, S., Limtong, S. and Lachance, M.A. 2015. Description of Diutina gen. Nov., Diutina siamensis, f.a. sp. Nov. and reassignment of Candida catenulata, Candida mesorugosa, Candida neorugosa, Candida pseudorugosa, Candida ranongensis, Candida rugosa and Candida scorzettiae to the genus Diutina. Int. J. Syst. Evol. Microbiol. 65, 4701-4709. '- Diddens, H.A., & Lodder, J., 1942
	Yuxuan Peng, Zhe Xiong, Juan Li, Jian-an Huang, Cuiqin Teng, Yushun Gong, and Zhonghua Liu. 2014.Water extract of the fungi from Fuzhuan brick tea improves the beneficial function on inhibiting fat deposition. Int J Food Sci Nutr. 65(5):610-4	NRRL 4222	Raper, K.B.; Fennell, D.I. 1965. The Genus Aspergillus:169
	Ratomahenina, R., Van den Booms, S., Galzy, P., Dieu, B., 1995. Study of growth parameters of Cylindrocarpon sp., a mould isolated from ""saint nectaire"" cheese. Chem Mikrobiol Technol Lebens 17, 169-171.	CBS 434,34	Schroers, H.J., O'Donnell, K., Lamprecht, S.C., Kammeyer, P.L., Johnson, S., Sutton, D.A., Rinaldi, M.G., Geiser D.M., Summerbell, R.C., 2009. Taxonomy and phylogeny of the Fusarium dimerum species group. Mycologia 101, 44-70.
	Thrane, U., 2007. Fungal protein for food. In: Dijksterhuis, J., Samson., R.A. (Eds.), Food Mycology. A multifaceted approach to fungi and food. CRC Press, Boca Raton, pp. 353-360.	CBS 5421	Nirenberg, H.I., 1995. Morphological differentiation of Fusarium sambucinum Fuckel sensu stricto, F. torulosum (Berk. & Curt.) Nirenberg comb. nov. and F. venenatum Nirenberg sp. nov. Mycopathologia 129, 131-141.
	Castellari, C., Quadrelli, A.M., Laich, F., 2010. Surface mycobiota on Argentinean dry fermented sausages. Int J Food Microbiol. 142, 149-55. Mounier, J., Monnet, C., Vallaeys, T., Arditi, R., Sarthou, A.S., Hélias, A., Irlinger, F., 2008. Microbial interactions within a cheese microbial community. Appl Environ Microbiol. 74, 172-81. Gueguen, M., Lenoir, J., 1975. Aptitude de l'espèce Geotrichum candidum à la production d'enzymes protéolytiques. Le Lait 55 (543-544) 145-162	CBS 178,71	Mounier J, Le Blay G, Vasseur V, Le Floch G, Jany JL, Barbier G., 2010. Application of denaturing high-performance liquid chromatography (DHPLC) for yeasts identification in red smear cheese surfaces. Lett Appl Microbiol. 51(1):18-23.
	Castellari, C., Quadrelli, A.M., Laich, F., 2010. Surface mycobiota on Argentinean dry fermented sausages. Int J Food Microbiol. 142, 149-55. Mounier, J., Monnet, C., Vallaeys, T., Arditi, R., Sarthou, A.S., Hélias, A., Irlinger, F., 2008. Microbial interactions within a cheese microbial community. Appl Environ Microbiol. 74, 172-81. Gueguen, M., Lenoir, J., 1975. Aptitude de l'espèce Geotrichum candidum à la production d'enzymes protéolytiques. Le Lait 55 (543-544) 145-162	CBS 615,84	De Hoog, G.S., Smith, M.T., 2004. Ribosomal gene phylogeny and species delimitation in Geotrichum and its teleomorphs. Stud Mycol 50, 489–515.
	Batra, L. R. and Millner, P. D., 1974. Some Asian fermented foods and beverages and associated fungi. Mycologia, 66, 942-950.	CBS 2532	Fell, J.W., Scorzetti, G., 2004. Reassignment of the basidiomycetous yeasts Trichosporon pullulans to Guehomyces pullulans gen. nov., comb. nov. and Hyalodendron lignicola to Trichosporon lignicola comb. nov. Int J Syst Evol Microbiol 54(3) 995-998
	Moreira, N., Mendes, F., Guedes de Pinho, P., Hogg, T., Vasconcelos, I., 2008. Heavy sulphur compounds, higher alcohols and esters production profile of Hanseniaspora uvarum and Hanseniaspora guilliermondii grown as a pure and mixed cultures in grape must. Int J Food Microbiol 124: 231–238.	CBS 465	Pijper, A., 1928. [A new Hanseniaspora] Verhandelingen, Koninklijke Nederlandse Akademie van Wetenschappen, Afdeling Natuurkunde 37 868-871
	Viana, F., Gil, J.V., Genovés, S., Vallés, S., Manzanares, P., 2008. Rational selection of non-Saccharomyces wine yeasts for mixed starters based on ester formation and enological traits. Food Microbiol 25: 778–785.	CBS 313	Phaff, H.J., Miller, M.W., Shifrine, M., 1956. The taxonomy of yeasts isolated from Drosophila in the Yosemite region of California. Antonie van Leeuwenhoek 22 145-161
	Moreira, N., Mendes, F., Guedes de Pinho, P., Hogg, T., Vasconcelos, I., 2008. Heavy sulphur compounds, higher alcohols and esters production profile of Hanseniaspora uvarum and Hanseniaspora guilliermondii grown as a pure and mixed cultures in grape must. Int J Food Microbiol 124: 231–238.	CBS 314	"Kreger-van Rij, N.J.W., 1984. The Yeasts: a taxonomic study Edition#3 1-1082"

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Fungi	Ascomycota	Saccharomycetaceae	Kazachstania	Kazachstania exigua		Dairy, Sourdough
Fungi	Ascomycota	Saccharomycetaceae	Kazachstania	Kazachstania unispora		Dairy
Fungi	Ascomycota	Saccharomycetaceae	Kloeckera	Kloeckera apiculata		Wine
Fungi	Ascomycota	Saccharomycetaceae	Kluyveromyces	Kluyveromyces africanus		Kombucha
Fungi	Ascomycota	Saccharomycetaceae	Kluyveromyces	Kluyveromyces lactis		Dairy
Fungi	Ascomycota	Saccharomycetaceae	Kluyveromyces	Kluyveromyces marxianus		Dairy
Fungi	Ascomycota	Saccharomycetaceae	Lachancea	Lachancea fermentati		Wine
Fungi	Ascomycota	Saccharomycetaceae	Lachancea	Lachancea thermotolerans		Wine
Fungi	Ascomycota	Cordycipitaceae	Lecanicillium	Lecanicillium lecanii		Dairy
Fungi	Ascomycota	Saccharomycetaceae	Metschnikowia	Metschnikowia pulcherrima		Wine
Fungi	Zygomycota	Mucoraceae	Mucor	Mucor fuscus		Dairy
Fungi	Zygomycota	Mucoraceae	Mucor	Mucor hiemalis		Soy

	Reference Food Usage	Type Strain	Reference Taxonomy
	" Zhou, J., Liu, X., Jiang, H., Dong, M., 2009. Analysis of the microflora in Tibetan kefir grains using denaturing gradient gel electrophoresis. Food Microbiol. 26, 770-5. Ottogalli, G., Galli, A., Foschino, R., 1996. Italian bakery products obtained with sour dough : Characterization of the typical microflora. Advances in food sciences 18, 131-144. "	CBS 379	"Kurtzman, C.P., Robnett, C.J., 2003. Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses. FEMS Yeast Res. 3, 417-32. Kurtzman, C.P., 2003. Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45."
	"Zhou, J., Liu, X., Jiang, H., Dong, M., 2009. Analysis of the microflora in Tibetan kefir grains using denaturing gradient gel electrophoresis. Food Microbiol. 26, 770-5. Wang, S.Y., Chen, H.C., Liu, J.R., Lin, Y.C., Chen, M.J., 2008. Identification of Yeasts and Evaluation of their Distribution in Taiwanese Kefir and Viili Starters. J Dairy Sci. 91, 3798-3805."	CBS398	"Kurtzman, C.P., Robnett, C.J., 2003. Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses. FEMS Yeast Res. 3, 417-32. Kurtzman, C.P., 2003. Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45."
	Charoenchai, C., Fleet, G.H., Henschke, P.A., Todd, B.E.N., 1997. Screening of non-Saccharomyces wine yeasts for the presence of extracellular hydrolytic enzymes, Australian Journal of Grape and Wine Research Vol. 3,p. 2-9	FRR 2168 ATCC 32856	Janke A. 1928, Uber die Formgattung Kloeckera Janke. Zentralbl. Bakteriol., II Abt. 76: 161.
	Jayabalan, R., Malbasa, R.V., Loncar, E.S., Vitas, J.S., and Sathishkumar, M., 2014. A Review on Kombucha Tea—Microbiology, Composition, Fermentation, Beneficial Effects, Toxicity, and Tea Fungus. Comprehensive Reviews in Food Science and Food Safety Vol. 13	ATCC 22294	"VAN DER WALT JP The yeast Kluyveromyces africanus nov. spec. and its phylogenetic significance Antonie Van Leeuwenhoek 22(4), 321-326, 1956"
	Roostita, R., Fleet, G.H., 1996. The occurrence and growth of yeasts in Camembert and Blue-veined cheeses. Int. J. Food Micorbiol. 28, 393-404. Dujon, B. et al., 2004. Genome evolution in yeasts. Nature 430, 35-44.	CBS 683	Kurtzman, C.P., Robnett, C.J., 2003. Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses. FEMS Yeast Res. 3, 417-32. Kurtzman, C.P., 2003. Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.
	Roostita, R., Fleet, G.H., 1996. The occurrence and growth of yeasts in Camembert and Blue-veined cheeses. Int. J. Food Micorbiol. 28, 393-404.	CBS 712	Kurtzman, C.P., Robnett, C.J., 2003. Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses. FEMS Yeast Res. 3, 417-32. Kurtzman, C.P., 2003. Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.
	Romano, P., Suzzi, G., Domizio, P., Fatichenti, F., 1997. Secondary products formation as a tool for discriminating non-Saccharomyces wine strains. Strain diversity in non-Saccharomyces wine yeasts. Antonie Van Leeuwenhoek. 71(3):239-42.	CBS 707	Kurtzman, CP., 2003. Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res 4 233-245.
	Pando, I., Garcia, M.J., Zuniga, M., Uruburu, F., 1989. Dynamics of Microbial Populations during Fermentation of Wines from the Utiel-Requena Region of Spain. App Env Microbiol 539-541 Gonzalez, S.S., Barrio, E., Querol, A., 2007. Molecular identification and characterization of wine yeasts isolated from Tenerife. J Appl Microbiolo 102 1018-1025.	CBS 6340	Jacquier, A., Dujon, B., 1983. ""The intron of the mitochondrial 21S rRNA gene: distribution in different yeast species and sequence comparison between Kluyveromyces thermotolerans and Saccharomyces cerevisiae."" Mol Gen Genet 192(3):487-99.
	Lund, F., Filtenborg, O., Frisvad, J.C., 1995. Associated mycoflora of cheese. Food Microbiology 12, 173-180.	CBS 102067	Zare, R., Gams, W., 2001. A revision of Verticillium section Prostrata. IV. The genera Lecanicillium and Simplicillium. Nova Hedwigia 73, 1-50.
	Charoenchai, C., Fleet, G.H., Henscke, P.A., Todd, B.E.N., 1997. Screening of non-Saccharomyces wine yeasts for the presene of extracellular hydrolytic enzymes. Aust. J. grape Wine Res. 3, 2-8	CBS 610	Pitt, J.I., Miller, M.W., 1968. Sporulation in Candida pulcherrima, Candida reukaufii and Chlamydozyma species: their relationships with Metschnikowia. Mycologia 60 (3) 663-85
	Hermet, A., Méheust, D., Mounier, J., Barbier, G., Jany, J. L., 2012. Molecular systematics in the genus Mucor with special regards to species encountered in cheese. Fungal Biol., 116, 692-705.	CBS 132.22	Walther, G., Pawłowska, J., Alastruey-Izquierdo, A., Wrzosek, M., Rodriguez-Tudela, J. L., Dolatabadi, S. Chakrabarti, A., de Hoog, G. S., 2013. DNA barcoding in Mucorales: an inventory of biodiversity. Persoonia, 30, 11-47.
	Han, B.Z., Kuijpers, A.F.A., Thanh, N.V., Nout., R.M.J., 2004. Mucoraceous moulds involved in the commercial fermentation of Sufu Pehtze. Antonie van Leeuwenhoek Volume 85, Number 3, 253-257.	CBS 201.65	Wehmer, C., 1903. Der Mucor der Hanfrötte, M. hiemalis nov. spec. Annales Mycologici 1, 37-41.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Fungi	Zygomycota	Mucoraceae	Mucor	Mucor lanceolatus		Dairy
Fungi	Zygomycota	Mucoraceae	Mucor	Mucor mucedo		Dairy
Fungi	Zygomycota	Mucoraceae	Mucor	Mucor plumbeus		Dairy
Fungi	Zygomycota	Mucoraceae	Mucor	Mucor racemosus		Dairy
Fungi	Ascomycota	Sordariaceae	Neurospora	Neurospora sitophila		Vegetables
Fungi	Ascomycota	Trichocomaceae	Penicillium	Penicillium biforme		Dairy
Fungi	Ascomycota	Trichocomaceae	Penicillium	Penicillium camemberti		Dairy
Fungi	Ascomycota	Trichocomaceae	Penicillium	Penicillium caseifulvum		Dairy
Fungi	Ascomycota	Trichocomaceae	Penicillium	Penicillium chrysogenum		Dairy
Fungi	Ascomycota	Trichocomaceae	Penicillium	Penicillium commune		Dairy
Fungi	Ascomycota	Trichocomaceae	Penicillium	Penicillium fuscoglaucum		Dairy
Fungi	Ascomycota	Trichocomaceae	Penicillium	Penicillium nalgiovense		Dairy, Meat
Fungi	Ascomycota	Trichocomaceae	Penicillium	Penicillium roqueforti		Dairy
Fungi	Ascomycota	Trichocomaceae	Penicillium	Penicillium salamii		Meat
Fungi	Ascomycota	Trichocomaceae	Penicillium	Penicillium solitum		Meat
Fungi	Ascomycota	Saccharomycetaceae	Pichia	Pichia anomala		Wine, Beer
Fungi	Ascomycota	Saccharomycetaceae	Pichia	Pichia fermentans		Dairy, Wine, Beer
Fungi	Ascomycota	Saccharomycetaceae	Pichia	Pichia kluyverii		Wine, Beer

	Reference Food Usage	Type Strain	Reference Taxonomy
	Hermet, A., Méheust, D., Mounier, J., Barbier, G., Jany, J. L., 2012. Molecular systematics in the genus Mucor with special regards to species encountered in cheese. Fungal Biol., 116, 692-705.	CBS 131276	Walther, G., Pawłowska, J., Alastruey-Izquierdo, A., Wrzosek, M., Rodriguez-Tudela, J. L., Dolatabadi, S. Chakrabarti, A., de Hoog, G. S., 2013. DNA barcoding in Mucorales: an inventory of biodiversity. Persoonia, 30, 11-47.
	Oterholm, A., 2003. [Norwegian cheeses from a historical perspective — Gamelost]. Meieriposten, 9, 200–211. Oterholm, A., 2003. [Norwegian cheeses from a historical perspective — Pultost]. Meieriposten, 9, 264–274.	CBS 640.67	Persoon, C.H., 1801.Synopsis methodica fungorum 1-706
	Han, B.Z., Rombouts, F.M., Nout, M.J., 2001. A Chinese fermented soybean food. Int J Food Microbiol. 65, 1-10. Hayaloglu, A.A., Kirbag, S., 2007. Microbial quality and presence of moulds in Kuflu cheese. Int J Food Microbiol. 115, 376-80.	CBS 129.41	Bonorden, H.F., 1864. Abhandlungen der Naturforschenden Gesellschaft zu Halle 8, 109.
	Han, B.Z., Rombouts, F.M., Nout, M.J., 2001. A Chinese fermented soybean food. Int J Food Microbiol. 65, 1-10. Hayaloglu, A.A., Kirbag, S., 2007. Microbial quality and presence of moulds in Kuflu cheese. Int J Food Microbiol. 115, 376-80.	CBS 260.68	Fresenius, G., 1850. Beiträge zur Mykologie 1, 12.
	Essers, A.J., Ebong, C., van der Grift, R.M., Nout, M.J., Otim-Nape, W., Rosling, H., 1995. Reducing cassava toxicity by heap-fermentation in Uganda. Int J Food Sci Nutr. 46(2):125-36.	CBS 381.50	Shear, G.L., Dodge, B.O., 1927. Life histories and heterothallism of the red bread-mold fungi of the Monilia sitophila group. J Agri Res 34(11) 1019-1041
	Ropars et al 2012. A taxonomic and ecological overview of cheese fungi	CBS 297.48	Giraud et al 2010. Microsatellite loci to recognize species for the cheese starter and contaminating strains associated with cheese manufacturing
	Moreau, C., 1979. Nomenclature des Penicillium utiles à la préparation du Camembert. Le Lait 59, 219-233.	CBS 299,48	Thom, C., 1906. Fungi in cheese ripening; Camembert and Roquefort. Bull. Bur. Anim. Ind. US Dep. Agric. 82, 33.
	Lund, F., Filtenborg, O., Frisvad, J.C., 1998. Penicillium caseifulvum, a new species found on fermented blue cheese. J. Food Mycol. 2, 95–100	CBS 101134	Lund, F., Filtenborg, O., Frisvad, J.C., 1998. Penicillium caseifulvum, a new species found on fermented blue cheese. J. Food Mycol. 2, 95-100.
	Lund, F., Filtenborg, O., Frisvad, J.C., 1995. Associated mycoflora of cheese. Food Microbiol.12, 173-180.	CBS 306,48	Thom, C., 1910. U.S.D.A. Bureau of Animal Industry Bulletin 118, 1-107.
	Lund, F., Filtenborg, O., Frisvad, J.C., 1995. Associated mycoflora of cheese. Food Microbiol.12, 173-180.	CBS 216,30	Thom, C., 1910. U.S.D.A. Bureau of Animal Industry Bulletin 118, 1-107.
	Ropars et al 2012. A taxonomic and ecological overview of cheese fungi	CBS 261.29	Giraud et al 2010. Microsatellite loci to recognize species for the cheese starter and contaminating strains associated with cheese manufacturing
	Farber, P., Geisen, R., 1994. Antagonistic Activity of the Food-Related Filamentous Fungus Penicillium nalgiovense by the Production of Penicillin. Appl Environ Mmicrobiol. 60, 3401-3404.	CBS 352,48	Laxa, O., 1932. Über die Reifung des Ellischauer Käses Zentralblatt für Bakteriologie und Parasitenkunde, Abteilung 2, 86, 160-165.
	Moreau, C., 1980. Le Penicillium roqueforti, morphologie, physiologie, intérêt en industrie fromagère, mycotoxines. (Révision bibliographique). Lait 60, 254-271.	CBS 221,30	Thom, C., 1906. Fungi in cheese ripening; Camembert and Roquefort. Bull. Bur. Anim. Ind. US Dep. Agric. 82, 33.
	Magista D et al : Penicillium salamii strain ITEM15302 : a new promising fungal staer for salami production, International journal of food microbiology 231 (2016) 33-41.	CBS 135391	Perrone G and al. : Penicillium salamii, a new species occuring during seasoning of dry-cured meatInternational, International journal of food microbiology 193 (2015) 91-98.
	Frisvad, J.C., Smedsgaard, J., Larsen, T.O., Samson, R.A., 2004. Mycotoxins, drugs and other extrolites produced by species in Penicillium subgenus Penicillium. Stud. Mycol., 49, 201-241.	CBS 288.36	Westling, R., 1911. Über die grünen Spezies der Gattung Penicillium Journal: Arkiv før Botanik 11, 1-156.
	Charoenchai, C., Fleet, G.H., Henschke, P.A., Todd, B.E.N., 1997. Screening of non-Saccharomyces wine yeasts for the presence of extracellular hydrolytic enzymes, Australian Journal of Grape and Wine Research Vol. 3,p. 2-9	MB#530461 CBS 104	Hanseniaspora uvarum (Niehaus) Shehata, Mrak & Phaff ex M.T. Sm. 1984, The Yeasts: a taxonomic study: 15 9 Originates from Hansens culture No. 27 of 13 May 1886
	Qing, M., Bai, M., Zhang, Y., Liu, W., Sun, Z., Zhang, H., Sun, T., 2010. Identification and biodiversity of yeasts from Qula in Tibet and milk cake in Yunnan of China. Wei Sheng Wu Xue Bao. 50, 1141-6. + 4 more ref. Bokulich, N.A., Bamforth, C. W. , Mills, D.A. 2012. Brewhouse-Resident Microbiota Are Responsible for Multi-Stage Fermentation of American Coolship Ale. PLoS ONE doi:10.1371/journal.pone.0035507	CBS187	Kurtzman, C.P., Robnett, C.J., 2003. Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses.FEMS Yeast Res. 3, 417-32.Kurtzman, C.P., 2003. Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.
	Pardo, I., Garcia, M.J., Zuniga, M., Uruburu, F., 1989. Dynamics of Microbial Populations during Fermentation of Wines from the Utiel-Requena Region of Spain. App Env Micro 539-541 + 2 more ref. Bokulich, N.A., Bamforth, C. W. , Mills, D.A. 2012. Brewhouse-Resident Microbiota Are Responsible for Multi-Stage Fermentation of American Coolship Ale. PLoS ONE doi:10.1371/journal.pone.0035507 N'guessan, K.F., Brou, K., Jacques, N., Casaregola, S., Dje, K.M. 2011. Identification of yeast during alcoholic fermentation of tchapalo, a traditional sorghum beer from Côte d 'Ivoire. Antonie van LLeeuwenhoek 99, 855-864 DOI 10.1007/s 10482-011-9560-7	CBS188	Kurtzman, C.P., Robnett, C.J., 1999. Identification and phylogeny of ascomycetous yeasts from analysis of nuclear large subunit (26S) ribosomal DNA partial sequences. Antonie van Leeuwenhoek 73, 331-71

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Fungi	Ascomycota	Saccharomycetaceae	Pichia	Pichia kudriavzevii		Dairy, Cocoa, Wine
Fungi	Ascomycota	Saccharomycetaceae	Pichia	Pichia membranifaciens		Dairy
Fungi	Ascomycota	Saccharomycetaceae	Pichia	Pichia norvegensis		Cereal
Fungi	Ascomycota	Saccharomycetaceae	Pichia	Pichia occidentalis		Dairy, Vegetables
Fungi	Zygomycota	Mucoraceae	Rhizopus	Rhizopus microsporus		Vegetables
Fungi	Zygomycota	Mucoraceae	Rhizopus	Rhizopus oligosporus		Soy
Fungi	Zygomycota	Mucoraceae	Rhizopus	Rhizopus oryzae		Soy
Fungi	Zygomycota	Mucoraceae	Rhizopus	Rhizopus stolonifer		Soy
Fungi	Ascomycota	Saccharomycetaceae	Saccharomyces	Saccharomyces bayanus		Wine, Beverages
Fungi	Ascomycota	Saccharomycetaceae	Saccharomyces	Saccharomyces cerevisiae		Dairy, Wine, Beverages

	Reference Food Usage	Type Strain	Reference Taxonomy
	Padonou, W.S., Nielsen, D.S., Hounhouigan, J.D., Thorsen, L., Nago, M.C., Jakobsen, M., 2009. The microbiota of Lafun, an African traditional cassava food product. Int J Food Microbiol. 133(1-2):22-30. Daniel, H.M., Vrancken, G., Takrama, J.F., Camu, N., De Vos, P., De Vuyst, L., 2009. Yeast diversity of Ghanaian cocoa bean heap fermentations.FEMS Yeast Res. 9(5):774-83. Bai, M., Qing, M., Guo, Z., Zhang, Y., Chen, X., Bao, Q., Zhang, H., Sun, T.S., 2010. Occurrence and dominance of yeast species in naturally fermented milk from the Tibetan Plateau of China. Can J Microbiol. 56(9):707-14 Li, S.S., Cheng, C., Li, Z., Chen, J.Y., Yan, B., Han, B.Z., Reeves, M., 2010. Yeast species associated with wine grapes in China. Int J Food Microbiol 138(1-2):85-90 El-Sharoud, W.M., Belloch, C., Peris, D., Querol, A., 2009. Molecular identification of yeasts associated with traditional Egyptian dairy products.J Food Sci. 74(7):M341-6.19 Osorio-Cadavid, E., Chaves-López, C., Tofalo, R., Paparella, A., Suzzi, G., 2008. Detection and identification of wild yeasts in Champús, a fermented Colombian maize beverage. Food Microbiol. 25(6):771-7 del Monaco S.M., Barda N.B., Rubio N.C. and Caballero A.C. (2014): Selection and characterization of a Patagonian Pichia kudriavzevii for wine deacidification, Journal of Applied Microbiology, Vol. 117, p. 415-464	CBS 5147	Kurtzman, C.P., Robnett, C.J., Basehoar-Powers, E., 2008. Phylogenetic relationships among species of Pichia, Issatchenkia and Williopsis determined from multigene sequence analysis, and the proposal of Barnettozyma gen. nov., Lindnera gen. nov. and Wickerhamomyces gen. nov. FEMS Yeast Res. (6):939-54.
	Shepherd, R., Rockey, J., Sutherland, I.W., Roller, S., 1995. Novel bioemulsifiers from microorganisms for use in foods. J Biotechnol. 40, 207-217.	CBS 107	Kurtzman, C.P., Robnett, C.J., Basehoar-Powers, E., 2008. Phylogenetic relationships among species of Pichia, Issatchenkia and Williopsis determined from multigene sequence analysis, and the proposal of Barnettozyma gen. nov., Lindnera gen. nov. and Wickerhamomyces gen. nov. FEMS Yeast Res. 8, 939-54.
	Unpasteurised commercial boza as a source of microbial diversity. Osimani A, Garofalo C, Aquilanti L, Milanović V, Clementi F. Int J Food Microbiol. 2015 Feb 2;194:62-70.	ATCC 58681	Sabouraudia. 1976 Mar;14(1):61-3. Pichia norvegensis sp. nov. Leask BG, Yarrow D.
	"Ongol, M.P., Asano, K., 2009. Main microorganisms involved in the fermentation of Ugandan ghee. Int J Food Microbiol. 133(3):286-91. Arroyo-López, F.N., Durán-Quintana, M.C., Ruiz-Barba, J.L., Querol, A., Garrido-Fernández, A., 2006. Use of molecular methods for the identification of yeast associated with table olives. Food Microbiol. (8):791-6. Seiler, H., Busse, M., 1990. The yeasts of cheese brines. Int. J. Food Microbiol., 11(3-4), 289-303"	CBS 5459	Kurtzman, C.P., Robnett, C.J., Basehoar-Powers, E., 2008. Phylogenetic relationships among species of Pichia, Issatchenkia and Williopsis determined from multigene sequence analysis, and the proposal of Barnettozyma gen. nov., Lindnera gen. nov. and Wickerhamomyces gen. nov. FEMS Yeast Res. (6):939-54.
	Shrestha, H., Rati, E.R., 2003. Defined microbial starter for the production of Poko - a traditional fermented food product of Nepal. Food Biotechnol 17(1) 15-25	CBS 631.82	Schipper, M.A.A, Stalpers, J.A., 1984. A revision of the genus Rhizopus. II. The Rhizopus microsporus-group. Studies in Mycology 25 20-34
	Rusmin, S., Ko, S.D., 1974. Rice-Grown Rhizopus oligosporus Inoculum for Tempeh Fermentation. Appl Microbiol. 28, 347-50.	CBS 377.62	Abe, A., Oda, Y., Asano, K , Sone, T., 2006. The molecular phylogeny of the genus Rhizopus based on rDNA sequences. Biosci Biotechnol Biochem. 70, 2387-93.
	Rehms H, Barz W., 1995. Degradation of stachyose, raffinose, melibiose and sucrose by different tempe-producing Rhizopus fungi. Appl Microbiol Biotechnol. 44(1-2):47-52. Essers AJ, Jurgens CM, Nout MJ., 1995. Contribution of selected fungi to the reduction of cyanogen levels during solid substrate fermentation of cassava. Int J Food Microbiol. 26(2):251-7.	CBS 111233	Went, F.A.F.C., Prinsen Geerligs, H.C., 1895. [Observation of Yeast and Moulds for Arack fermentation]. Verhandelingen, Koninklijke Nederlandse Akademie van Wetenschappen, Afdeling Natuurkunde 4 3-31
	Rehms H, Barz W., 1995. Degradation of stachyose, raffinose, melibiose and sucrose by different tempe-producing Rhizopus fungi. Appl Microbiol Biotechnol. 44(1-2):47-52. Essers AJ, Jurgens CM, Nout MJ., 1995. Contribution of selected fungi to the reduction of cyanogen levels during solid substrate fermentation of cassava. Int J Food Microbiol. 26(2):251-7.	CBS 403.51	Liou, G.Y., Chen, S.R., Wei, Y.H., Lee, F.L., Fu, H.M., Yuan, G.F., Stalpers, J.A., 2007. Polyphasic approach to the taxonomy of the Rhizopus stolonifer group. Myc Res III 196-203
	Rainieri, S., Kodama, Y., Kaneko, Y., Mikata, K., Nakao, Y. Ashikari, T., 2006. Pure and mixed genetic lines of Saccharomyces bayanus and Saccharomyces pastorianus and their contribution to the lager brewing strain genome. Appl Envir Microbiol 72, 3968-3974.	CBS395	Kurtzman, C.P., Robnett, C.J., 2003. Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses. FEMS Yeast Res. 3, 417-32. Kurtzman, C.P., 2003. Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.
	Roostita, R., Fleet, G.H., 1996. The occurrence and growth of yeasts in Camembert and Blue-veined cheeses. Int. J. Food Micorbiol. 28, 393-404.	CBS1171	Kurtzman, C.P., Robnett, C.J., 2003. Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses. FEMS Yeast Res. 3, 417-32. Kurtzman, C.P., 2003. Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage
Fungi	Ascomycota	Saccharomycetaceae	Saccharomycoides	Saccharomycodes ludwigii		Kombucha
Fungi	Ascomycota	Schizosaccharo-mycetaceae	Schizosaccharo-myces	Schizosaccharomyces pombe		Wine
Fungi	Ascomycota	Saccharomycetaceae	Schwanniomyces	Schwanniomyces vanrijiae		Wine
Fungi	Ascomycota	Microascaceae	Scopulariopsis	Scopulariopsis flava		Dairy
Fungi	Ascomycota	Wallemiaceae	Sporendonema	Sporendonema casei		Dairy
Fungi	Ascomycota	Saccharomycetaceae	Starmerella	Starmerella bombicola		Wine
Fungi	Ascomycota	Sarcosomataceae	Torulaspora	Torulaspora delbrueckii		Dairy, Wine
Fungi	Ascomycota	Saccharomycetaceae	Trigonopsis	Trigonopsis cantarellii		Wine
Fungi	Ascomycota	Saccharomycetaceae	Wickerhamomyces	Wickerhamomyces anomalus		Wine
Fungi	Ascomycota	Saccharomycetaceae	Wickerhamomyces	Wickerhamomyces pijperi		Wine
Fungi	Ascomycota	Dipodascaceae	Yarrowia	Yarrowia lipolytica		Dairy
Fungi	Ascomycota	Saccharomycetaceae	Zygosaccharomyces	Zygosaccharomyces kombuchaensis		Kombucha
Fungi	Ascomycota	Saccharomycetaceae	Zygosacharomyces	Zygosaccharomyces rouxii		Soy
Fungi	Ascomycota	Saccharomycetaceae	Zygotorulaspora	Zygotorulaspora florentina		Dairy

	Reference Food Usage	Type Strain	Reference Taxonomy
	Jayabalan, R., Malbasa, R.V., Loncar, E.S., Vitas, J.S., and Sathishkumar, M., 2014. A Review on Kombucha Tea—Microbiology, Composition, Fermentation, Beneficial Effects, Toxicity, and Tea Fungus. Comprehensive Reviews in Food Science and Food Safety Vol. 13	ATCC 11313	E.C. Hansen, 1904. Zentbl. Bakt. ParasitKde, Abt. II 12(19-21): 538.
	Snow, P.G., Gallender, G.F., 1979. Deacidification of white table wines through partial fermentation by Schizosaccharomyces pombe. Am J Enol Viticult 30: 45–48.	CBS 356	Lindner, P., 1893. [Schizosaccharomyces pombe n. sp., a new starter] Wochenschrift für Brauerei 10 1298-1300
	Garcia, A., Carcel, C., Dalau, L., Samson, A., Aguera, E., Agosin, E., Gunata, Z., 2002. Influence of a mixed culture with Debaryomyces vanriji and Saccharomyces cerevisiae on the volatiles in a Muscat wine. J Food Sci 67: 1138–1143.	CBS 3024	Kurtzman, C.P., Suzuki, M., 2010. Phylogenetic analysis of ascomycete yeasts that form coenzyme Q-9 and the proposal of the new genera Babjeviella, Meyerozyma, Millerozyma, Priceomyces, and Scheffersomyces. Mycoscience 51: 2-14.
	Spotti, E., Berni, E., Cacchioli, C., 2008. Characteristics and Applications of Molds. Meat Biotechnology Part II, 181-195 Moreau, C., 1979. Nomenclature des Penicillium utiles à la préparation du Camembert. Lait 59 219-233	CBS 207.61	Morton, F.J.; Smith, G., 1963, Mycological Papers 86: 1-96.
	Ratomahenina, R., Chabalier, C., Galzy, P., 1994. Concerning Sporendonema casei Desmazieres [France, moulds in cheeses] Latte 19(6) 616-617	CBS 355.29	Desmazières, J.B.H.J., 1827. Annales des Sciences Naturelles, Botanique 11: 246-249.
	Ciani, M., Maccarelli, F., 1998. Oenological properties of non-Saccharomyces yeasts associated with winemaking. World J Microb Biot 14: 199–203.	CBS 6009	Rosa,C.A., Lachance, M.A., 1998. The yeast genus Starmerella gen. nov. and Starmerella bombicola comb. nov., the teleomorph of Candida bombicola (Spencer, Gorin et Tullock) Meyer et Yarrow. Int J Syst Evol Microbiol 48 1413-1417.
	Westall, S., Filreenborg ,O., 1998. Yeast occurance in Danish feta cheeses. Food Micro. 15, 215-222. Wyder, T.M., Spillmann, H., Puhan, Z., 1997. Investigation of yeast flora in dairy products. Food technol. biotechnol. 35, 4, 299-304. Pando, I., Garcia, M.J., Zuniga, M., Uruburu, F., 1989. Dynamics of Microbial Populations during Fermentation of Wines from the Utiel-Requena Region of Spain. App. and Env. Microbiol. 539-541	CLIB 230	Oda, Y., Yabuki, M., Tonomura, K., Fukunaga, M., 1997. Reexamination of Yeast Strains Classified as Torulaspora delbrueckii (Lindner). Int J Syst Bacteriol 47, 1102-1106
	Toro, M.E., Vazquez, F., 2002. Fermentation behaviour of controlled mixed and sequential cultures of Candida cantarellii and Saccharomyces cerevisiae wine yeasts. World J Microb Biot 18: 347–354.	ATCC 36588	Kurtzman, C.P., Robnett, C.J., 2007.Multigene phylogenetic analysis of theTrichomonascus , Wickerhamiella and Zygoascus yeast clades, and the proposal of Sugiyamaella gen.nov. and14 newspecies combinations. FEMS Yeast Res 7 141–151
	Kurita, O., 2008. Increase of acetate ester-hydrolysing esterase activity in mixed cultures of Saccharomyces cerevisiae and Pichia anomala. J Appl Microbiol 104: 1051–1058.	CBS 5759	Kurtzman, C. P., Robnett, C. J. , Basehoar-Powers, E., 2008. Phylogenetic relationships among species of Pichia, Issatchenkia and Williopsis determined from multigene sequence analysis, and the proposal of Barnettozyma gen. nov., Lindnera gen. nov. and Wickerhamomyces gen. nov. FEMS Yeast Res 8:939-54
	Zagorc, T., Maraz, A., Cadez, N., Povhe Jemec, K., Peter, G., Resnik, M., Nemanic, J., Raspor, P., 2001. Indigenous wine killer yeast and therir application as a starter culture in wine fermentation. Food Micro. 2001, 18, 441-451	CBS 2887	Kurtzman, C. P., Robnett, C. J., & Basehoar-Powers, E. (2008). Phylogenetic relationships among species of pichia, issatchenkia and williopsis determined from multigene sequence analysis, and the proposal of barnettozyma gen. nov., lindnera gen. nov. and wickerhamomyces gen. nov.. Fems Yeast Research, 8(6), 939-954.
	Boekhout, T., Robert, V., (Eds.), 2003. Yeasts in food: Beneficial and detrimental aspects. Behr's Verlag, Hamburg.	CBS 6124	Walt, J.P. van der; von Arx, J.A., 1980. The yeast genus Yarrowia gen. nov. Antonie van Leeuwenhoek 46, 517-521.
	Jayabalan, R., Malbasa, R.V., Loncar, E.S., Vitas, J.S., and Sathishkumar, M., 2014. A Review on Kombucha Tea—Microbiology, Composition, Fermentation, Beneficial Effects, Toxicity, and Tea Fungus. Comprehensive Reviews in Food Science and Food Safety Vol. 13	CBS 8849	Rapid identification of Zygosaccharomyces with genus-specific primers. Hulin M, Wheals A. Int J Food Microbiol. 2014 Mar 3;173:9-13.
	Hesseltine, C.W., Shibasaki, K., 1961. MisoIII. Pure Culture Fermentation with Saccharomyces rouxii. Appl Microbiol. 9: 515–518 Suezawa, Y., Suzuki, M., Mori, H., 2008. Genotyping of a Miso and Soy Sauce Fermentation Yeast, Zygosaccharomyces rouxii, Based on Sequence Analysis of the Partial 26S Ribosomal RNA Gene and Two Internal Transcribed Spacers, Biosci Biotechnol Biochem. 72:2452-5. Solieri, L., Giudici, P., 2008. Yeasts associated to Traditional Balsamic Vinegar: ecological and technological features. Int J Food Microbiol 125(1):36-45.	CBS 732	Lodder & Kreger-van Rij 1984, The Yeast: a Taxonomie Study p.462
	Boekhout, T., Robert, V., (Eds.), 2003. Yeasts in food: Beneficial and detrimental aspects. Behr's Verlag, Hamburg.	CBS 647	Kurtzman, C.P., Fell, J.W., Boekhout, T., 2011. The Yeasts: A Taxonomic Study, 5th edition. 3 Vol. Amsterdam: Elsevier Science & Technology.

Publication #2 – Bulletin of the IDF N° 514/2022: Inventory of microbial food cultures with safety demonstration in fermented food products. Update of the Bulletins of the IDF 377/2002, 455/2012 and 495/2018

Bourdichon, F., Budde-Niekiel, A., Fritz, D., Hatte, J.L., Laulund, S., Mac Auliffe, O., Ouwehand, A., Yao, S., Zgoda, A., Zuliani, V., Morelli, L., 2022.

Since 2002, the International Dairy Federation (IDF), in collaboration with the European Food and Feed Cultures Association (EFFCA), has been conducting a project on demonstration of the safety of microbial food cultures. The first inventory of food cultures was published in 2002 (IDF Bulletin 377-2002, Mogensen et al., 2002a & 2002b), the scientific rationale for the inventory of microbial food cultures demonstrated as safe for use in food product(s) was published in a peer review journal in 2012 (Bourdichon et al., 2012a), and the inventory updated accordingly (IDF Bulletin 455-2012, Bourdichon et al., 2012b & 2012c & 2012d).
The inventory was updated for a third time in 2018 (IDF Bulletin 495-2018, Bourdichon et al., 2018) to include further food cultures species and update of taxonomy. It was then considered to extend the inventory to other food matrices than dairy, and consider multiple food sources for a food species where the inventory was initially focusing mostly on dairy fermented food products.
A questionnaire has been sent in 2020 to all national committees of the IDF for inclusion of new species, new food usages and updated taxonomy. The current IDF Bulletin provides an updated inventory that replaces the ones published in 2002, 2012 and 2018. The changes in the composition and layout of the inventory are presented in the bulletin.

Available at:
https://fil-idf.org/publications/bulletin/inventory-of-microbial-food-cultures-with-safety-demonstration-in-fermented-food-products/

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2022

Bulletin

of the International Dairy Federation

Inventory of microbial food cultures with safety demonstration in fermented food products

Update of the Bulletins of the IDF N°377-2002, N°455-2012 and N°495-2018

Fédération Internationale du Lait
FIL IDF
International Dairy Federation

Inventory of microbial food cultures with safety demonstration in fermented food products

Update of the Bulletin of the IDF N°377-2002, N°455-2012 and N°495-2018

François Bourdichon[1,2]*, Andrea Budde-Niekiel[3], Aurélie Dubois[4], Duresa Fritz[5], Jean-Louis Hatte[6], Svend Laulund[7], Olivia McAuliffe[8], Arthur C. Ouwehand[9], Su Yao[10], Annabelle Zgoda[6], Véronique Zuliani[11], Lorenzo Morelli[2]

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FOREWORD

When publishing the first inventory of microbial food cultures in 2002, a project on the demonstration of the safety of microbial food cultures, it was known that updating the inventory of microbial species used in fermented food products would be a never-ending task.

In consequence, work has continued on the publication and it is, therefore, the result of a thorough evaluation of emerging scientific evidence.

The current IDF Bulletin provides an updated inventory that replaces the ones published in 2002, 2012 and 2018. It includes further food cultures species and an update of taxonomy. Because the microbial food cultures can be used in various food matrices, the inventory has also been extended to other food matrices than simply dairy and it considers multiple food sources for a food species where the inventory was initially focussing mostly on dairy fermented food products.

The work was carried out by a joint Action Team of the Standing Committee on Microbiological Hygiene (SCMH) and the Standing Committee on Dairy Science and Technology (SCDST). The present inventory has been consolidated and finalized with comments received from members of SCMH, SCDST and IDF National Committees.

All contributors are acknowledged for their participation in this extensive work which was completed in due time. This Action Team will remain active in order to monitor developments and decide on the initiation of a future update based on a number of species received for inclusion and/or major taxonomical changes.

We hope you will find this bulletin useful.

Enjoy reading it!

Caroline Emond
Director General
International Dairy Federation

Inventory of microbial food cultures with safety demonstration in fermented food products
Update of the Bulletin of the IDF N°377-2002, N°455-2012 and N° 495-2018

ABSTRACT

Since 2002, the International Dairy Federation (IDF), in collaboration with the European Food and Feed Cultures Association (EFFCA), has been conducting a project on the demonstration of the safety of microbial food cultures. The first inventory of food cultures was published in 2002 [14, 15], the scientific rationale for the inventory of microbial food cultures demonstrated as safe for use in food product(s) was published in a peer review journal in 2012 [1], and the inventory updated accordingly [2, 3, 4].

The inventory was updated for a third time in 2018 [5] to include further food cultures species and an update of taxonomy. It was then decided to extend the inventory to other food matrices than dairy and consider multiple food sources for a food species wherever the inventory was initially focusing mostly on dairy fermented food products.

A questionnaire was sent to all national committees of the IDF in 2020 for inclusion of new species, new food usages and an updated taxonomy. The current IDF Bulletin provides an updated inventory that replaces the ones published in 2002, 2012 and 2018. The changes in the composition and layout of the inventory are presented in the bulletin.

Keywords: *Food cultures, fermentation, fermented foods, food usage, taxonomy, safety demonstration, history of use.*

174 pages (A4) in English

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The Action Team members would like to thank the National Committees for their support on this project and for the numerous suggestions regarding the incorporation of new species, as well as the Scientific Committees of the IDF for their review (Analytical Methods for Dairy Microorganisms – SCAMDM; Dairy Science and Technology – SCDST; Nutrition and Health – SCNH; Microbiological Hygiene – SCMH)

The IDF Head Office and Scientific Programme Coordination Committee (SPCC) are particularly acknowledged for their practical support of the project.

1 INTRODUCTION: A POSITIVE LIST FOR USE OF FOOD CULTURES

The 20 years (plus) International Dairy Federation (IDF) European Food and Feed Cultures Association (EFFCA) initiative is not the only attempt to develop an inventory of food cultures, to provide a scientific position for regulatory guidelines for the trade of fermented food products. There have been several attempts to provide a global approach before - Campbell-Platt in 1994 [7], and afterwards, Tamang et al., in 2016 [17].

The approaches can only provide a picture of the known science at a specific time. Which is soon outdated when considering the evolution of food science in the fermentation process and with new insights into the taxonomy of microorganisms. Different initiatives have been taken by various organizations to define:

Food cultures of traditional fermented foods

- Denmark: Danish list of notified microbial cultures applied in food (last modified in 2016)
- China (1st list published in 2010 and regularly updated, food cultures)
- International Dairy Federation & European Food and Feed Cultures Association (IDF – EFFCA)
- Food Agriculture Organization of the United Nations bulletins #134 – Fermented fruits and vegetables, #138 – Fermented Cereals, #142 – Fermented grain legumes, seeds and nuts.

Safety demonstration of identified strains for use in the food chain

- European Food Safety Authority (EFSA): Biohazard Panel Qualified Presumption of Safety (QPS). QPS assessment was developed internally by the Biohazard Panel as a harmonised generic pre-assessment to support safety risk assessments performed by EFSA scientific panels. It was introduced initially for harmonising the assessment of notified biological agents across EFSA's Scientific Panels and Units.
- United States Food and Drug Agency: Generally Recognized As Safe (GRAS). Under sections 201(s) and 409 of the Federal Food, Drug, and Cosmetic Act (the Act), "any substance that is intentionally added to food is a food additive, that is subject to premarket review and approval by FDA, unless the substance is generally recognized, among qualified experts, as having been adequately shown to be safe under the

conditions of its intended use, or unless the use of the substance is otherwise exempted from the definition of a food additive".

- China (2nd list published in 2010 and regularly updated, probiotic strains for use in infant formulae).

Food cultures and their history of safe use, or strain level safety demonstration, are two approaches that will generate lists of species of micro-organisms. The comparison of these lists (The outcome) is of limited relevance as they are established with a very different level of evidence (The rationale). During a dedicated regulatory workshop in 2018 (http://miffi.org), both the QPS approach from EFSA and the IDF–EFFCA approach were discussed. The outcome has been published in a special issue of FEMS Microbiology Newsletter [6, 12]. This distinction between the QPS approach and the IDF-EFFCA approach has already been raised by EFSA following the publication of the rationale in 2012 [5], yet the debate returns regularly.

2 INCLUSION PROCESS FOR NEW FOOD CULTURE SPECIES

Since the IDF–EFFCA initiative aims to provide a positive list of food cultures in food fermentation, it needs a rationale for the construction of this list and a transparent process of inclusion. While the rationale has its specific publication, this has not been the case for the process of inclusion of new species. When contemplating the extension to various food usage, it is necessary to provide insights on how new submitted species and/or food usages are considered. In the initial publications of the IDF Bulletin #455-2012, the need for a regular update was already anticipated. The frequency of the updating process, however, depends on a significant change in the scientific demonstration of food usage, taxonomy and/or safety concerns.

The process of the incorporation of a new species composes the following steps (Annex 2):

Documentation of the history of use with peer-reviewed reference of food usage

Documentation is not just the occurrence of a microorganism in a fermented food product, but also the evidence whether the presence of the microorganism is beneficial, fortuitous or undesired. Multiple food usages are accepted.

Taxonomical identification according to international guidelines (International Union of Microbial Societies)

Classification of the International Committee on Systematics of Prokaryotes

(ICSP—http://www.the-icsp.org/)

Publications in the International Journal of Systematic and Evolutionary Microbiology (IJSEM—http://ijs.sgmjournals.org/)

Taxonomic Outline of the Bacteria and Archaea (TOBA http://www.taxonomicoutline.org/)

Amended lists of bacterial names [20]

Definition of type strain

The following criteria are, therefore, required for consideration: Species, Sub Species, Food Usage, Reference Food Usage, Type Strain, Reference Taxonomy. The information and the references are sent from each National Committee of the IDF to the Action Team members. The proposal is reviewed in duplicate by the Action Team members and a decision is taken consensually for inclusion or not. The updated list is reviewed by the referent Standing Committees (Analytical Methods for Dairy Microorganisms – SCAMDM; Dairy Science and Technology – SCDST; Nutrition and Health – SCNH; Microbiological Hygiene – SCMH) and a second round includes a review by all the National Committees before acceptance for publication in an IDF Bulletin.

Considering these different steps, an update of the IDF Bulletin takes around three years, at best, to complete. The current list of food cultures is, therefore, continuously growing despite occasional deletions (due mostly to change of taxonomy and re-assignment).

3 CHANGES IN TAXONOMY

As techniques for identification of microbial isolates evolve, so do the taxa for numerous species. The major change for this update came (finally) from the long-awaited update of taxonomy of the genus *Lactobacillus* and union of *Lactobacillaceae* and *Leuconostocaceae* [19]. Other taxonomical changes also needed to be considered.

Out of the 314 species in the inventory, 95 are new taxa (of which only 16 are, strictly speaking, new species).

Lactobacillus figidus is an invalid taxon and has been deleted.

Pediococcus cerevisiae is an invalid taxon, synonym of *Pediococcus damnosus.*

Pseudomonas syringae has been deleted from the list, recent publications highlight a role of the species as a plant pathogen and the demonstration of safe use should be done for each strain individually if a food application is to be considered. But the species cannot be granted a safety status and further inclusion in the inventory.

4

CROSS-OVER FERMENTATION AND THE APPLICATION TO VARIOUS FOOD MATRICES

As proposed by Dank and co-authors [10], "Cross-over fermentations are processes in which a microorganism from one traditional fermentation process is introduced onto a new substrate and/or to a new partner".

Cross-over fermentation represents an interesting potential for the development of new fermented food products, considering the diversity of microorganisms used in traditional fermentation processes and the vast number of alternative substrates. The traditional use, however, which grants a history of safe use, is not applicable anymore and a specific safety demonstration for this new food usage must be demonstrated [8, 9]. In Dank and co-authors' case demonstration [10] for the new usage of *Aspergillus oryzae*, the potential of mycotoxin production in the new food matrix should not be overlooked. The same point is valid for the present update, where *C. butyricum* is considered a food culture for a non-dairy food matrix, when it is known to be a spoiler of concern (blowing) for hard type cheeses. As such, the IDF approach has been applied to traditional fermented foods in China, with the new proposed species included in the present fourth update [18].

Guidelines, recommendations and expert reviews exist for demonstrating the steps to document and validate the safety of microorganisms used in foods, independent of the mode of action of the food cultures [13]. Even if a microorganism originates from an established traditional/artisanal fermented food, a thorough safety examination must be performed also at the strain level before it is used as a food culture [9]. Isolation of microorganisms from spontaneous fermented foods are, in many cases, the way to find an optimal starter culture, as nature has selected and domesticated it through evolution [16]. The knowledge gained from newer methods such as metagenomics for analysing fermented food will assist the understanding of microbial genetic resources and find key activities of beneficial food culture strains that will ensure process efficiency, product quality and safety of common fermented food [11].

The present update merges the 31 food usages of the previous version of the inventory into seven categories, 617 food usages proposed for the 325 listed species:

Bakery	47	Plant Based	187
Alcoholic Beverages	102	Seafood	31
Dairy	176	Vinegar	16
Meat	58		

5 CONCLUSION

Establishing a positive list of food cultures with a history of safe use in the various fermented food matrices is an endless task. The evolution of science in Food Microbiology, the input of molecular technologies helping to unravel the unknown (which is far bigger than anticipated) and the major trend in recent years to cross-over fermentation makes this work challenging yet highly necessary. The extension to non-dairy food matrices also provides a reflection upon what is really known and understood about the use of food cultures in a specific matrix. Cross-over fermentation does not only offer the opportunity to apply a fermentation process to a new food matrix, it also helps to build evidence and to understand the historical empirical process that was led by a failure/success approach to the traditional use of food cultures.

This also challenges the approach of the history of safe use for the safety demonstration of a food culture. There can be more than simple observation of the facts, deciphering the biochemical mechanisms for better and/or new application.

This fourth update was perhaps the most challenging to accomplish - enabling the dairy microbiology community of the IDF to consider other food matrices, but it is only the first landmark which will be followed by other regular updates as science and knowledge continue to grow.

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Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Actinobacteria*	*Bifidobacteriaceae*	*Bifidobacterium*	*Bifidobacterium adolescentis*		Plant Based	Macedo, R.F., Freitas, R.J., Pandey, A., Soccol, C.R. (1999). Production and shelf-life studies of low cost beverage with soy milk, buffalo cheese whey and cow milk fermented by mixed cultures of Lactobacillus casei ssp. shirota and Bifidobacterium adolescentis. J Basic Microbiol. 39:243-51.	ATCC 15703	Reuter, G. (1963). Vergleichende Untersuchung über die Bifidus-Flora im Säuglings- und Erwachsenenstuhl.Zentralbl. Bakteriol. Parasitenkd. Infektionskr. Hyg.Abt. 1, Orig. Reihe A191 486–507.
Monera	*Actinobacteria*	*Bifidobacteriaceae*	*Bifidobacterium*	*Bifidobacterium adolescentis*		Dairy	Rabiu, B.A. (2001). Synthesis and fermentation properties of novel galacto-oligosaccharides by beta-galactosidases from Bifidobacterium species. Appl Environ Microbiol. 67, 2526-30.	ATCC 15703	Reuter, G. (1963). Vergleichende Untersuchung über die Bifidus-Flora im Säuglings- und Erwachsenenstuhl. Zentralbl. Bakteriol. Parasitenkd. Infektionskr. Hyg. Abt. 1, Orig. Reihe A191 486–507.
Monera	*Actinobacteria*	*Bifidobacteriaceae*	*Bifidobacterium*	*Bifidobacterium animalis*	*Bifidobacterium animalis* subsp. *animalis*	Dairy	Biavati, B., Mattarelli, P., Crociani, F. (1992). Identification of bifidobacteria from fermented milk products. Microbiologica 15, 7-13.	ATCC 25527	Masco, L., Ventura, M., Zink, R., Huys, G., Swings, J. (2004). Polyphasic taxonomic analysis of Bifidobacterium animalis and Bifidobacterium lactis reveals relatedness at the subspecies level: reclassification of Bifidobacterium animalis as Bifidobacterium animalis subsp. animalis subsp. nov. and Bifidobacterium lactis as Bifidobacterium animalis subsp. lactis subsp. nov. Int J Syst Evol Microbiol 2004; 54:1137-1143.
Monera	*Actinobacteria*	*Bifidobacteriaceae*	*Bifidobacterium*	*Bifidobacterium animalis*	*Bifidobacterium animalis* subsp. *lactis*	Dairy	Biavati, B., Mattarelli, P., Crociani, F. (1992). Identification of bifidobacteria from fermented milk products. Microbiologica 15, 7-13.	DSM 10140	Meile, L., Ludwig, W., Rueger, U., Gut, C., Kaufmann, P., Dasen, G., Wenger, S., Teuber, M. (1997). Bifidobacterium lactis sp.nov., a moderately oxygen tolerant species isolated from fermented milk. Syst. Appl. Microbiol. 20, 57–64.
Monera	*Actinobacteria*	*Bifidobacteriaceae*	*Bifidobacterium*	*Bifidobacterium animalis*	*Bifidobacterium animalis* subsp. *lactis*	Alcoholic Beverages	Sohrabvandi, S., Mousavi, S.M., Razavi, S.H., Shaheed Behesti. (2010). Viability of probiotic bacteria in low alcohol and non-alcoholic beer during refrigerated storage. 93, 104-108.	DSM 10140	Meile, L., Ludwig, W., Rueger, U., Gut, C., Kaufmann, P., Dasen, G., Wenger, S., Teuber, M. (1997). Bifidobacterium lactis sp.nov., a moderately oxygen tolerant species isolated from fermented milk. Syst. Appl. Microbiol. 20, 57–64.
Monera	*Actinobacteria*	*Bifidobacteriaceae*	*Bifidobacterium*	*Bifidobacterium animalis*	*Bifidobacterium animalis* subsp. *lactis*	Plant Based	Buruleanu, C., Nicolescu, C., Avram, D., Manea, I., Bratu, M. (2012). Effects of yeast extract and different amino acids on the dynamics of some components in cabbage juice during fermentation with Bifidobacterium lactis BB-12. Food Science & Biotechnology, 21, 691-699.	DSM 10140	Meile, L., Ludwig, W., Rueger, U., Gut, C., Kaufmann, P., Dasen, G., Wenger, S., Teuber, M. (1997). Bifidobacterium lactis sp.nov., a moderately oxygen tolerant species isolated from fermented milk. Syst. Appl. Microbiol. 20, 57–64.
Monera	*Actinobacteria*	*Bifidobacteriaceae*	*Bifidobacterium*	*Bifidobacterium animalis*	*Bifidobacterium animalis* subsp. *lactis*	Plant Based	Guney, D., Güngörmüşler, M. (2020). Development and Comparative Evaluation of a Novel Fermented Juice Mixture with Probiotic Strains of Lactic Acid Bacteria and Bifidobacteria Probiotics Antimicr Pept doi: 10.1007/s12602-020-09710-2	DSM 10140	Meile, L., Ludwig, W., Rueger, U., Gut, C., Kaufmann, P., Dasen, G., Wenger, S., Teuber, M. (1997). Bifidobacterium lactis sp.nov., a moderately oxygen tolerant species isolated from fermented milk. Syst. Appl. Microbiol. 20, 57–64.
Monera	*Actinobacteria*	*Bifidobacteriaceae*	*Bifidobacterium*	*Bifidobacterium animalis*	*Bifidobacterium animalis* subsp. *lactis*	Plant Based	Pavunc, A.P., Penava, L., Ranilović, J., Novak Banić, M., Butorac, K., Petrović, E., Mihaljević-Herman, V., Bendelja, K., Mlakar, A.S., Durgo, K., Kos, B., Šušković, J. (2019). Influence of Dehydrated Wheat/Rice Cereal Matrices on Probiotic Activity of Bifidobacterium animalis ssp. lactis BB-12®. Food Technol. Biotechnol. 57, 147-158. https://doi.org/10.17113/ftb.57.02.19.6142	DSM 10140	Meile, L., Ludwig, W., Rueger, U., Gut, C., Kaufmann, P., Dasen, G., Wenger, S., Teuber, M. (1997). Bifidobacterium lactis sp.nov., a moderately oxygen tolerant species isolated from fermented milk. Syst. Appl. Microbiol. 20, 57–64.
Monera	*Actinobacteria*	*Bifidobacteriaceae*	*Bifidobacterium*	*Bifidobacterium bifidum*		Dairy	Ventling, B.L., Mistry, V.V. (1993). Growth characteristics of bifidobacteria in ultrafiltered milk. J Dairy Sci. 76, 962-71.	ATCC 29521	Orla-Jensen, S. (1924). La classification des bactéries lactiques. Lait 4, 468–474.
Monera	*Actinobacteria*	*Bifidobacteriaceae*	*Bifidobacterium*	*Bifidobacterium bifidum*		Seafood	Rodpai, R., Sanpool, O., Thanchomnang, T., Wangwiwatsin, A., Sadaow, L., Phupiewkham, W., Boonroumkaew, P., Intapan, P. M., Maleewong, W. (2021). Investigating the microbiota of fermented fish products (Pla-ra) from different communities of northeastern Thailand. PLOS ONE. 16(1):e0245227	ATCC 29521	Orla-Jensen, S. (1924). La classification des bactéries lactiques. Lait 4, 468–474.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Actinobacteria*	*Bifidobacteriaceae*	*Bifidobacterium*	*Bifidobacterium bifidum*		Plant Based	Puri, A., Mir, S.R., Panda, B.R. (2015). Effect of sequential bio-processing conditions on the content and composition of vitamin K2 and isoflavones in fermented soy food. J Food Sci Technol. 52(12): 8228–8235.	ATCC 29521	Orla-Jensen, S. (1924). La classification des bactéries lactiques. Lait 4, 468–474.
Monera	*Actinobacteria*	*Bifidobacteriaceae*	*Bifidobacterium*	*Bifidobacterium breve*		Dairy	Reuter, G. (1990). Bifidobacteria Cultures as Components of Yoghurt-Like Products Bifidobacteria Microflora 9 (2), 107-118	ATCC 15700	Reuter, G. (1963). Vergleichende Untersuchunge über die Bifidus-Flora im Säuglings- und Erwachsenenstuhl. Zentralbl. Bakteriol. Parasitenkd. Infektionskr. Hyg. Abt. 1, Orig. Reihe A191 486–507.
Monera	*Actinobacteria*	*Bifidobacteriaceae*	*Bifidobacterium*	*Bifidobacterium breve*		Plant Based	Scalabrini, P., Rossi, M., Spettoli, P., Matteuzzi, D. (1998). Characterization of Bifidobacterium strains for use in soymilk fermentation. Int J Food Microbiol 39(3):213-219	ATCC 15700	Reuter, G. (1963). Vergleichende Untersuchunge über die Bifidus-Flora im Säuglings- und Erwachsenenstuhl. Zentralbl. Bakteriol. Parasitenkd. Infektionskr. Hyg. Abt. 1, Orig. Reihe A191 486–507.
Monera	*Actinobacteria*	*Bifidobacteriaceae*	*Bifidobacterium*	*Bifidobacterium longum*	*Bifidobacterium longum* subsp. *infantis*	Dairy	Daigle, A., Roy, D., Belanger, G., Vuilemard, J.C. (1999). Production of probiotic cheese (cheddar-like cheese) using enriched cream fermented by Bifidobacterium infantis. J Dairy Sci. 82(6):1081-91.	ATCC 15697	Mattarelli, P., Bonaparte, C., Pot, B., Biavati, B. (2008). Proposal to reclassify the three biotypes of Bifidobacterium longum as three subspecies: Bifidobacterium longum subsp. longum subsp. nov., Bifidobacterium longum subsp. infantis comb. nov. and Bifidobacterium longum subsp. suis comb. nov. Int J Syst Evol Microbiol. 58(Pt 4):767-72
Monera	*Actinobacteria*	*Bifidobacteriaceae*	*Bifidobacterium*	*Bifidobacterium longum*	*Bifidobacterium longum* subsp. *longum*	Dairy	Anaerobe. (2012). Feb;18(1):14-8. doi: 10.1016/j.anaerobe. 2011.11.004. Epub 2011 Nov 26. Benef Microbes. 2016 Sep;7(4):473-84. doi: 10.3920/BM2015.0173. Epub 2016 May 2.	ATCC 15707	Mattarelli, P., Bonaparte, C., Pot, B., Biavati, B. (2008). Proposal to reclassify the three biotypes of Bifidobacterium longum as three subspecies: Bifidobacterium longum subsp. longum subsp. nov., Bifidobacterium longum subsp. infantis comb. nov. and Bifidobacterium longum subsp. suis comb. nov. Int J Syst Evol Microbiol. 58(Pt 4):767-72
Monera	*Actinobacteria*	*Bifidobacteriaceae*	*Bifidobacterium*	*Bifidobacterium pseudolongum*		Dairy	Rabiu, B.A. (2001). Synthesis and fermentation properties of novel galacto-oligosaccharides by beta-galactosidases from Bifidobacterium species. Appl Environ Microbiol. 67, 2526-30.	ATCC 25526	Nouioui, I., Carro, L., García-López, L., Meier-Kolthoff, J.P., Woyke, T. et al. (2007). Genome-based taxonomic classication of the phylum Actinobacteria. Front Microbiol 2007;2018:9
Monera	*Actinobacteria*	*Bifidobacteriaceae*	*Bifidobacterium*	*Bifidobacterium psychraerophilum*		Dairy	Hsieh, H.H., Wang, S-Y., Chen, T.-L., Huang, Y.-L., Chen, M.-J. (2012). Effects of cow's and goat's milk as fermentation media on the microbial ecology of sugary kefir grains. Int J Food Microbiol. 157(1): 73-81.	DSM 22366	Simpson, P.J., Ross, R.P., Fitzgerald, G.F., Stanton, C. (2004). Bifidobacterium psychraerophilum sp. nov. and Aeriscardovia aeriphila gen. nov., sp. nov., isolated from a porcine caecum. Int J Syst Evol Microbiol. 54: 401-406.
Monera	*Actinobacteria*	*Brevibacteriaceae*	*Brevibacterium*	*Brevibacterium antiquum*		Dairy	Ozturkoglu Budak, S.O., Figge, M.J., Houbraken, J., de Vries, R.P. (2016). The diversity and evolution of microbiota in traditional Turkish Divle Cave cheese during ripening. Int. Dairy J. 58, 50–54	LMG 22206	Gavrish, E. Yu, Krauzova, V.I., Potekhina, N.V., Karasev, S.G., Plotnikova E.G., Altyntseva O.V., Korosteleva, L.A. and Evtushenko L.I. (2004). Three New Species of Brevibacteria, Brevibacterium antiquum sp. nov., Brevibacterium aurantiacum sp. nov., and Brevibacterium permense sp. nov. Microbiology (English translation of Mikrobiologiya) 73,176-183.
Monera	*Actinobacteria*	*Brevibacteriaceae*	*Brevibacterium*	*Brevibacterium aurantiacum*		Dairy	Leclercq-Perlat, M.N., Corrieu, G., Spinnler, H.E. (2007). Controlled production of camembert-type cheeses: part III role of the ripening microflora on free fatty acid concentrations. J Dairy Res. 74, 218-25.	ATCC 9175	Gavrish, E.Yu., Krauzova, V.I., Potekhina, N.V., Karasev, S.G., Plotnikova, E.G., Altyntseva, O.V., Korosteleva, L.A., Evtushenko, L.I. (2004). Three new species of brevibacteria, Brevibacterium antiquum sp. nov., Brevibacterium aurantiacum sp. nov., and Brevibacterium permense sp. nov. Microbiology (English translation of Mikrobiologiya) 73, 176–183.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Actinobacteria*	*Brevibacteriaceae*	*Brevibacterium*	*Brevibacterium casei*		Dairy	Piton, C., Fontanier, C. (1990). Caractérisation d'une collection de souches de bactéries corynéformes de la morge du gruyère de Comté. Lait 70, 383-398	ATCC 35513	Collins, M.D., Farrow, J.A.E., Goodfellow, M., Minnikin, D.E. (1983). Brevibacterium casei sp.nov. and Brevibacterium epidermidis sp.nov. Systematic and Applied Microbiology 4, 388-395.
Monera	*Actinobacteria*	*Brevibacteriaceae*	*Brevibacterium*	*Brevibacterium iodinum*		Dairy	International Journal of Food Microbiology 47 (1999). 89–97. Analysis of the bacterial surface ripening flora of German and French smeared cheeses with respect to their anti-listerial potential. Markus C. Carnio, Ilka Eppert, Siegfried Scherer	ATCC 49514	Collins, M.D., Jones, D., Keddie, R.M., Sneath, P.H.A. (1980). Reclassification of Chromobacterium iodinum (Davis) in a redefined genus Brevibacterium (Breed) as Brevibacterium iodinum nom. rev.; comb. nov. J. Gen. Microbiol., 1980, 120, 1-10.
Monera	*Actinobacteria*	*Brevibacteriaceae*	*Brevibacterium*	*Brevibacterium linens*		Dairy	Albert, J.O., Long, H.F., Hammer, B.W. (1944). Classification of the organisms important in dairy products. IV. Bacterium linens. Iowa State Coll. Agr. Expt. Sta. Bull.,No. 328.	DSM 20425	Breed, R.S. (1953). The Brevibacteriaceae fam. nov. of order Eubacteriales. Riassunti delle Communicazione VI. Congresso Internazionale di Microbiologia, Roma; 1:13-14.
Monera	*Actinobacteria*	*Corynebacteriaceae*	*Corynebacterium*	*Corynebacterium ammoniagenes*		Dairy	Eliskases-Lechner, F., Ginzinger, W. (1995). The bacterial flora of surface-ripened cheeses with special regard to coryneforms. Le Lait, INRA Editions, 75 (6), pp.571-584.	ATCC 6871	Collins, M.D. (1987). Transfer of Brevibacterium ammoniagenes (Cooke and Keith) to the genus Corynebacterium, as Corynebacterium ammoniagenes comb. nov. Int. J. Syst. Bacteriol. 37, 442–443.
Monera	*Actinobacteria*	*Corynebacteriaceae*	*Corynebacterium*	*Corynebacterium casei*		Dairy	Bockelmann, W., Willems, K.P., Neve, H., Heller, K.H. (2005). Cultures for the ripening of smear cheeses. International Dairy Journal 15, 719-732.	DSM 44701	Brennan, N.M., Brown, R., Goodfellow, M., Ward, A.C., Beresford, T.P., Simpson, P.J., Fox, P.F., Cogan, T.M. (2001). Corynebacterium mooreparkense sp. nov. and Corynebacterium casei sp. nov., isolated from the surface of a smear-ripened cheese. Int. J. Syst. Evol. Microbiol. 51, 843–852.
Monera	*Actinobacteria*	*Corynebacteriaceae*	*Corynebacterium*	*Corynebacterium variabile*		Dairy	Bockelmann, W., Willems, K.P., Neve, H., Heller, K.H. (2005). Cultures for the ripening of smear cheeses. International Dairy Journal 15, 719-732.	ATCC 15753	Collins MD. (1987). Transfer of Arthrobacter variabilis (Müller) to the genus Corynebacterium, as Corynebacterium variabilis comb. nov. Int. J. Syst. Bacteriol. 1987; 37:287-288.
Monera	*Actinobacteria*	*Corynebacteriaceae*	*Corynebacterium*	*Microbacterium flavum*		Dairy	Brennan, N.M., Ward, A.C., Beresford, T.P., Fox, P.F., Goodfellow, M., Cogan, T.M. (2002). Biodiversity of the Bacterial Flora on the Surface of a Smear Cheese Appl. Environ. Microbiol. 68, 820-830.	ATCC 10340	Barksdale, L., Lanéelle, M.A., Pollice, M.C., Asselineau, J., Welby, M., Norgard, M.V. (1979). Biological and chemical basis for the reclassification of Microbacterium flavum Orla-Jensen as Corynebacterium flavescens nom. nov. Int. J. Syst. Bacteriol. 29, 222–233.
Monera	*Actinobacteria*	*Dermabacteraceae*	*Brachybacterium*	*Brachybacterium alimentarium*		Dairy	Schubert, K., Ludwig, W., Springer, N., Kroppenstedt, R.M., Accolas, J.P., Fiedler, F. (1996). Two coryneform bacteria isolated from the surface of French Gruyère and Beaufort cheeses of the genus brachybacterium: Brachybacterium alimentarium sp. nov. and Bracybacterium tyrofermentans sp. nov. Int J Syst Bacteriol. 46, 81-7.	ATCC 700067	Schubert, K., Ludwig, W., Springer, N., Kroppenstedt, R.M., Accolas, J.P., Fiedler, F. (1996). Two coryneform bacteria isolated from the surface of French Gruyère and Beaufort cheeses of the genus brachybacterium: Brachybacterium alimentarium sp. nov. and Bracybacterium tyrofermentans sp. nov. Int J Syst Bacteriol. 46, 81-7.
Monera	*Actinobacteria*	*Dermabacteraceae*	*Brachybacterium*	*Brachybacterium nesterenkovii*		Dairy	Gvozdyak, O.R., Nogina, T.M., Schumann, P. (1992). Taxonomic study of the genus Brachybacterium: Brachybacterium nesterenkovii sp. nov. Int. J. Syst. Bacteriol., 1992, 42, 74-78.	DSM 9573	Gvozdyak, O.R., Nogina, T.M., Schumann, P. (1992). Taxonomic study of the genus Brachybacterium: Brachybacterium nesterenkovii sp. nov. Int. J. Syst. Bacteriol., 1992, 42, 74-78.
Monera	*Actinobacteria*	*Dermabacteraceae*	*Brachybacterium*	*Brachybacterium paraconglomeratum*		Dairy	Callon, C., Duthoit, F., Delbes, C., Ferrand, M., Le Frileux, Y., De Cremoux, R., Montel, M.C. (2007). Stability of microbial communities in goat milk during a lactation year: Molecular approaches. 2007. Syst. Appl. Microbiol. 30,547-560	ATCC 51843	Takeuchi, M., Fang, C.X. and Yokota, A. (1995). Taxonomic study of the genus Brachybacterium: proposal of Brachybacterium conglomeratum sp. nov., nom. rev., Brachybacterium paraconglomeratum sp. nov., and Brachybacterium rhamnosum sp. nov. Int. J. Syst. Bacteriol. 45, 160-168.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Actinobacteria*	*Dermabacteraceae*	*Brachybacterium*	*Brachybacterium tyrofermentans*		Dairy	Schubert, K., Ludwig, W., Springer, N., Kroppenstedt, R.M., Accolas, J.P., Fiedler, F. (1996). Two coryneform bacteria isolated from the surface of French Gruyère and Beaufort cheeses of the genus brachybacterium: Brachybacterium alimentarium sp. nov. and Bracybacterium tyrofermentans sp. nov. Int J Syst Bacteriol. 46, 81-7.	ATCC 700068	Schubert, K., Ludwig, W., Springer, N., Kroppenstedt, R.M., Accolas, J.P., Fiedler, F. (1996). Two coryneform bacteria isolated from the surface of French Gruyère and Beaufort cheeses of the genus brachybacterium: Brachybacterium alimentarium sp. nov. and Bracybacterium tyrofermentans sp. nov. Int J Syst Bacteriol. 46, 81-7.
Monera	*Actinobacteria*	*Microbacteriaceae*	*Agrococcus*	*Agrococcus casei*		Dairy	Roth, E., Miescher Schwenninger, S., Hasler, M., Eugster-Meier, E., Lacroix, C. (2010). Population dynamics of two antilisterial cheese surface consortia revealed by temporal temperature gradient gel electrophoresis. BMC Microbiol. 10,74.	DSM 18061	Bora, N., Vancanneyt, M., Gelsomino, R., Swings, J., Brennan, N., Cogan, T.M., Larpin, S., Desmasures, N., Lechner, F.E., Kroppenstedt, R.M., Ward, A.C., Goodfellow, M. (2007). Agrococcus casei sp. nov., isolated from the surfaces of smear-ripened cheeses. Int J Syst Evol Microbiol. 57, 92-97.
Monera	*Actinobacteria*	*Microbacteriaceae*	*Leucobacter*	*Leucobacter komagatae*		Dairy	Mounier, J., Monnet, C., Jacques, N., Antoinette, A., Irlinger, F. (2009). Assessment of the microbial diversity at the surface of Livarot cheese using culture-dependent and independent approaches. Int J Food Microbiol. 133,31-7.	DSM 8803	Takeuchi, M., Weiss, N., Schumann, P. and Yokota, A. (1996). Leucobacter komagatae gen. nov., sp. nov., a new aerobic gram-positive, nonsporulating rod with 2,4-diaminobutyric acid in the cell wall. Int. J. Syst. Bacteriol. 46,967-971.
Monera	*Actinobacteria*	*Microbacteriaceae*	*Microbacterium*	*Microbacterium foliorum*		Dairy	Deetae, P., Bonnarme, P., Spinnler, H.E., Helinck, S. (2007). Production of volatile aroma compounds by bacterial strains isolated from different surface-ripened French cheeses. Appl Microbiol Biotechnol. 76,1161-71.	DSM 12966	Behrendt, U., Ulrich, A. and Schumann, P. (2001). Description of Microbacterium foliorum sp. nov. and Microbacterium phyllosphaerae sp. nov., isolated from the phyllospheres of grasses and the surface litter after mulching the sward, and reclassification of Aureobacterium resistens (Funke et al. 1998) as Microbacterium resistens comb. nov. Int. J. Syst. Evol. Microbiol. 51,1267-1276.
Monera	*Actinobacteria*	*Microbacteriaceae*	*Microbacterium*	*Microbacterium gubbeenense*		Dairy	Cogan, T.M., Goerges, S., Gelsomino, R., Larpin, S., Hohenegger, M., Bora, N., Jamet, E., Rea, M.C., Mounier, J., Vancanneyt, M., Guéguen, M., Desmasures, N., Swings, J., Goodfellow, M., Ward, A.C., Sebastiani, H., Irlinger, F., Chamba, J.F., Beduhn, R., Scherer, S. (2014). Biodiversity of the Surface Microbial Consortia from Limburger, Reblochon, Livarot, Tilsit, and Gubbeen Cheeses. Microbiol Spectr. 2014 Feb;2(1):CM-0010-2012. doi: 10.1128/microbiolspec.CM-0010-2012. PMID: 26082119. Mounier, J., Monnet, C., Jacques, N., Antoinette, A., Irlinger, F. (2009). Assessment of the microbial diversity at the surface of Livarot cheese using culture-dependent and independent approaches. Int J Food Microbiol. 2009 Jul 31;133(1-2):31-7. doi: 10.1016/j.ijfoodmicro.2009.04.020. Epub 2009 Apr 24. PMID: 19481828	DSM 15944	Brennan, N.M., Brown, R., Goodfellow, M., Ward, A.C., Beresford, T.P., Vancanneyt, M., Cogan, T.M., Fox, P.F. (2001). Microbacterium gubbeenense sp. nov., from the surface of a smear-ripened cheese. International Journal of Systematic and Evolutionary Microbiology 51, 1969-1976.
Monera	*Actinobacteria*	*Micrococcaceae*	*Arthrobacter*	*Arthrobacter crystallopoietes*		Dairy	Carnio, M.C., Eppert, I., Scherer, S. (1999). Analysis of the bacterial surface ripening flora of German and French smeared cheeses with respect to their anti-listerial potential International Journal of Food Microbiology 47 89–97	ATCC 15481	Ensign, J.C., Rittenberg, S.C. (1963). A crystalline pigment produced from 2-hydroxypyridine by Arthrobacter crystallopoietes n. sp. Archiv für Mikrobiologie, 1963, 47, 137-153.
Monera	*Actinobacteria*	*Micrococcaceae*	*Arthrobacter*	*Arthrobacter globiformis*		Dairy	Eliskases-Lechner, F., Ginzinger, W. (1995). The bacterial flora of surface-ripened cheeses with special regard to coryneforms. Le Lait, INRA Editions, 1995, 75 (6), pp.571-584.	ATCC 8010	Conn, H.J. (1928). A type of bacteria abundant in productive soils, but apparently lacking in certain soils of low productivity. New York State Agricultural Experimental Station Technical Bulletin No. 138:3–26.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Actinobacteria*	*Micrococcaceae*	*Glutamicibacter*	*Glutamicibacter arilaitensis*		Dairy	Mounier, J., Gelsomino, R., Goerges, S., Vancanneyt, M., Vandemeulebroecke, K., Hoste, B., Scherer, S., Swings, J., Fitzgerald, G.F., Cogan, T.M. (2005). Surface microflora of four smear-ripened cheeses. Appl Environ Microbiol. 71, 6489-500.	DSM 16368	Busse, H.J. (2016). Review of the taxonomy of the genus Arthrobacter, emendation of the genus Arthrobacter sensu lato, proposal to reclassify selected species of the genus Arthrobacter in the novel genera Glutamicibacter gen. nov., Paeniglutamicibacter gen. nov., Pseudoglutamicibacter gen. nov., Paenarthrobacter gen. nov. and Pseudarthrobacter gen. nov., and emended description of Arthrobacter roseus. Int. J. Syst. Evol. Microbiol., 66, 9-37.
Monera	*Actinobacteria*	*Micrococcaceae*	*Glutamicibacter*	*Glutamicibacter bergerei*		Dairy	Irlinger, F., Bimet, F., Delettre, J., Lefevre, M., Grimont, P.A.D. (2005). Arthrobacter bergerei sp. nov. and Arthrobacter arilaitensis sp. nov., novel coryneform species isolated from the surfaces of cheeses. Int. J. Syst. Evol. Microbiol. 55, 457-462.	DSM 16367	Busse, H.J. (2016). Review of the taxonomy of the genus Arthrobacter, emendation of the genus Arthrobacter sensu lato, proposal to reclassify selected species of the genus Arthrobacter in the novel genera Glutamicibacter gen. nov., Paeniglutamicibacter gen. nov., Pseudoglutamicibacter gen. nov., Paenarthrobacter gen. nov. and Pseudarthrobacter gen. nov., and emended description of Arthrobacter roseus. Int. J. Syst. Evol. Microbiol., 66, 9-37.
Monera	*Actinobacteria*	*Micrococcaceae*	*Glutamicibacter*	*Glutamicibacter nicotianae*		Dairy	Smacchi, E., Gobbetti, M.,Lanciotti, R., Fox, P.F. (1999). Purification and characterization of an extracellular proline imin peptidase from Arthrobana, FEMS Microbiol Lett. 178(1):191-7. Smacchi, E., Fox, P.F., Gobbetti, M. (1999). Purification and characterization of two extracellular proteinases from Arthrobacter nicotianae 9458. FEMS Microbiol Lett. 170, 327-33.	ATCC 14929	Busse, H.J. (2016). Review of the taxonomy of the genus Arthrobacter, emendation of the genus Arthrobacter sensu lato, proposal to reclassify selected species of the genus Arthrobacter in the novel genera Glutamicibacter gen. nov., Paeniglutamicibacter gen. nov., Pseudoglutamicibacter gen. nov., Paenarthrobacter gen. nov. and Pseudarthrobacter gen. nov., and emended description of Arthrobacter roseus. Int. J. Syst. Evol. Microbiol., 66, 9-37.
Monera	*Actinobacteria*	*Micrococcaceae*	*Glutamicibacter*	*Glutamicibacter protophormiae*		Dairy	Carnio, M.C., Eppert, I., Scherer, S. (1999). Analysis of the bacterial surface ripening flora of German and French smeared cheeses with respect to their anti-listerial potential International Journal of Food Microbiology 47 89–97	ATCC 19271	Busse, H.J. (2016). Review of the taxonomy of the genus Arthrobacter, emendation of the genus Arthrobacter sensu lato, proposal to reclassify selected species of the genus Arthrobacter in the novel genera Glutamicibacter gen. nov., Paeniglutamicibacter gen. nov., Pseudoglutamicibacter gen. nov., Paenarthrobacter gen. nov. and Pseudarthrobacter gen. nov., and emended description of Arthrobacter roseus. Int J Syst Evol Microbiol 2016; 66:9-37.
Monera	*Actinobacteria*	*Micrococcaceae*	*Kocuria*	*Kocuria rhizophila*		Dairy	El-Baradei, G., Delacroix-Buchet, A., Ogier, J.C. (2007). Biodiversity of bacterial ecosystems in traditional Egyptian Domiati cheese. Appl Environ Microbiol. 73, 1248-55.	DSM 11926	Kovács, G., Burghardt, J., Pradella, S., Schumann, P., Stackebrandt, E., Màrialigeti, K. (1999). Kocuria palustris sp. nov. and Kocuria rhizophila sp. nov., isolated from the rhizoplane of the narrow-leaved cattail (Typha angustifolia). Int J Syst Bacteriol. 49, 167-73.
Monera	*Actinobacteria*	*Micrococcaceae*	*Kocuria*	*Kocuria varians*		Dairy	O'Mahony, T., Rekhif, N., Cavadini, C., Fitzgerald, G.F. (2001). The application of a fermented food ingredient containing 'variacin', a novel antimicrobial produced by Kocuria varians, to control the growth of Bacillus cereus in chilled dairy products. J Appl Microbiol. 90, 106-14.	DSM 20033	Stackebrandt, E., Koch, C., Gvozdiak, O., Schumann, P. (1995). Taxonomic dissection of the genus Micrococcus: Kocuria gen. nov., Nesterenkonia gen. nov., Kytococcus gen. nov., Dermacoccus gen. nov., and Micrococcus Cohn 1872 gen. emend. Int. J. Syst. Bacteriol. 45, 682-692. ex Micrococcus varians Migula 1900 (Approved Lists 1980)

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Actinobacteria*	*Micrococcaceae*	*Micrococcus*	*Micrococcus luteus*		Dairy	Feng, Z., Huang, S., Ai, Z.W., Zhang, M., Zhai, S., Chen, X. (2016). Evaluation of autochthonous micrococcus strains as starter cultures for the production of Kedong sufu. J Appl Microbiol. 2016 Mar;120(3):671-83. doi: 10.1111/jam.13023. PMID: 26666740. Mounier, J., Gelsomino, R., Goerges, S., Vancanneyt, M., Vandemeulebroecke, K., Hoste, B., Scherer, S., Swings, J., Fitzgerald, G.F., Cogan, T.M. (2005). Surface microflora of four smear-ripened cheeses. Appl Environ Microbiol. 2005 Nov;71(11):6489-500. doi: 10.1128/AEM.71.11.6489-6500.2005. PMID: 16269673; PMCID: PMC1287636	ATCC 4698 DSM 20030	Wieser, M., Denner, E.B.M., Kampfer, P., Schumann, P., Tindall, B., Steiner, U., Vybiral, D., Lubitz, W., Maszenan, A.M., Patel, B.K.C., Seviour, R.J., Radax, C., Busse, H.J. (2002). Emended descriptions of the genus Micrococcus, Micrococcus luteus (Cohn 1872) and Micrococcus lylae (Kloos et al. 1974). Int. J. Syst. Evol. Microbiol.52, 629-637
Monera	*Actinobacteria*	*Micrococcaceae*	*Micrococcus*	*Micrococcus luteus*		Seafood	Anihouvi, V.B., Sakyi-Dawson, E., Ayernor, G.S., Hounhouigan, J.D. (2007). Microbiological changes in naturally fermented cassava fish (Pseudotolithus sp.) for lanhouin production. Int J Food Microbiol. 2007 May 10;116(2):287-91. doi: 10.1016/j.ijfoodmicro.2006.12.009. Epub 2007 Jan 12. PMID: 17291615.	ATCC 4698 DSM 20030	Wieser, M., Denner, E.B.M., Kampfer, P., Schumann, P., Tindall, B., Steiner, U., Vybiral, D., Lubitz, W., Maszenan, A.M., Patel, B.K.C., Seviour, R.J., Radax, C., Busse, H.J. (2002). Emended descriptions of the genus Micrococcus, Micrococcus luteus (Cohn 1872) and Micrococcus lylae (Kloos et al. 1974). Int. J. Syst. Evol. Microbiol.52, 629-637
Monera	*Actinobacteria*	*Micrococcaceae*	*Micrococcus*	*Micrococcus luteus*		Meat	Iacumin, L., Manzano, M., Comi, G. (2012). Catalase-positive cocci in fermented sausage: Variability due to different pork breeds, breeding systems and sausage production technology. Food Microbiol. 2012 Apr;29(2):178-86. doi: 10.1016/j.fm.2011.09.005. Epub 2011 Sep 22. PMID: 22202871.	ATCC 4698 DSM 20030	Wieser, M., Denner, E.B.M., Kampfer, P., Schumann, P., Tindall, B., Steiner, U., Vybiral, D., Lubitz, W., Maszenan, A.M., Patel, B.K.C., Seviour, R.J., Radax, C., Busse, H.J. (2002). Emended descriptions of the genus Micrococcus, Micrococcus luteus (Cohn 1872) and Micrococcus lylae (Kloos et al. 1974). Int. J. Syst. Evol. Microbiol.52, 629-637
Monera	*Actinobacteria*	*Micrococcaceae*	*Micrococcus*	*Micrococcus lylae*		Meat	García Fontán, M.C. (2007). Microbiological characteristics of androlla, a Spanish traditional pork sausage. Food Microbiol. 24, 52-8.	ATCC 27566 DSM 20315	Wieser, M., Denner, E.B.M., Kampfer, P., Schumann, P., Tindall, B., Steiner, U., Vybiral, D., Lubitz, W., Maszenan, A.M., Patel, B.K.C., Seviour, R.J., Radax, C., Busse, H.J. (2002). Emended descriptions of the genus Micrococcus, Micrococcus luteus (Cohn 1872) and Micrococcus lylae (Kloos et al. 1974). Int. J. Syst. Evol. Microbiol.52, 629-637
Monera	*Actinobacteria*	*Micrococcaceae*	*Paenarthrobacter*	*Paenarthrobacter aurescens*		Dairy	Carnio, M.C., Eppert, I., Scherer, S. (1999). Analysis of the bacterial surface ripening flora of German and French smeared cheeses with respect to their anti-listerial potential International Journal of Food Microbiology 47 89–97	ATCC 13344	Busse, H.J. (2016). Review of the taxonomy of the genus Arthrobacter, emendation of the genus Arthrobacter sensu lato, proposal to reclassify selected species of the genus Arthrobacter in the novel genera Glutamicibacter gen. nov., Paeniglutamicibacter gen. nov., Pseudoglutamicibacter gen. nov., Paenarthrobacter gen. nov. and Pseudarthrobacter gen. nov., and emended description of Arthrobacter roseus. Int J Syst Evol Microbiol 2016; 66:9-37.
Monera	*Actinobacteria*	*Micrococcaceae*	*Paenarthrobacter*	*Paenarthrobacter ilicis*		Dairy	Carnio, M.C., Eppert, I., Scherer, S. (1999). Analysis of the bacterial surface ripening flora of German and French smeared cheeses with respect to their anti-listerial potential International Journal of Food Microbiology 47 89–97	ATCC 14264	Busse, H.J. (2016). Review of the taxonomy of the genus Arthrobacter, emendation of the genus Arthrobacter sensu lato, proposal to reclassify selected species of the genus Arthrobacter in the novel genera Glutamicibacter gen. nov., Paeniglutamicibacter gen. nov., Pseudoglutamicibacter gen. nov., Paenarthrobacter gen. nov. and Pseudarthrobacter gen. nov., and emended description of Arthrobacter roseus. Int J Syst Evol Microbiol 2016; 66:9-37.
Monera	*Actinobacteria*	*Propionibacteriaceae*	*Acidipropionibacterium*	*Acidipropionibacterium acidipropionici*		Dairy	Sherman, J.M. (1921). The cause of eyes and characteristic flavor of Emmental cheese. J. Bact. 6, 379-392.	ATCC 25562 DSM 4900	Orla-Jensen, S. (1909). Die Hauptlinien des natürlichen Bakteriensystems. Zb. Bakteriol., Abt. 2 22, 305-346.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Actinobacteria*	*Propionibacteriaceae*	*Acidipropionibacterium*	*Acidipropionibacterium acidipropionici*		Plant Based	Warminska-Radyko, I., Laniewska-Trokenheim, L., Gerlich, J. (2006). Fermented multi-vegetable juices supplemented with Propionibacterium cell biomass / Fermentowane soki wielowarzywne suplementowane biomasa komorek Propionibacterium.Polish Journal of Food and Nutrition Sciences (Poland). 2006. v. 15/56(4) p. 433-436	ATCC 25562 DSM 4900	Orla-Jensen, S. (1909). Die Hauptlinien des natürlichen Bakteriensystems. Zb. Bakteriol., Abt. 2 22, 305-346.
Monera	*Actinobacteria*	*Propionibacteriaceae*	*Acidipropionibacterium*	*Acidipropionibacterium jensenii*		Dairy	Britz, T.J., Riedel, K.H. (1994). Propionibacterium species diversity in Leerdammer cheese. Int J Food Microbiol. 1994 Jun;22(4):257-67. doi: 10.1016/0168-1605(94)90177-5. PMID: 7986677. Yee, A.L., Maillard, M.B., Roland, N., Chuat, V., Leclerc, A., Pogačić, T., Valence, F., Thierry, A. (2014). Great interspecies and intraspecies diversity of dairy propionibacteria in the production of cheese aroma compounds. Int J Food Microbiol. 2014 Nov 17;191:60-8. doi: 10.1016/j.ijfoodmicro.2014.09.001. Epub 2014 Sep 6. PMID: 25233451. Darilmaz, D.O., Beyatli, Y. (2012). Acid-bile, antibiotic resistance and inhibitory properties of propionibacteria isolated from Turkish traditional home-made cheeses. Anaerobe. 2012 Feb;18(1):122-7. doi: 10.1016/j.anaerobe.2011.10.002. Epub 2011 Oct 14. PMID: 22019987.	ATCC 4868 DSM 20535	Britz, T.J., Riedel, K.H. (1994). Propionibacterium species diversity in Leerdammer cheese. Int J Food Microbiol. 22, 257-67.
Monera	*Actinobacteria*	*Propionibacteriaceae*	*Acidipropionibacterium*	*Acidipropionibacterium jensenii*		Plant Based	Van Niel, 1928. The genus Propionibacterium. J.W. Boisevain, Haarlem, the Netherlands. Warminska-Radyko, I., Laniewska-Trokenheim, L., Gerlich, J. (2006). Fermented multi-vegetable juices supplemented with Propionibacterium cell biomass / Fermentowane soki wielowarzywne suplementowane biomasa komorek Propionibacterium.Polish Journal of Food and Nutrition Sciences 2006. v. 15/56(4) p. 433-436	ATCC 4868 DSM 20535	Britz, T.J., Riedel, K.H. (1994). Propionibacterium species diversity in Leerdammer cheese. Int J Food Microbiol. 22, 257-67.
Monera	*Actinobacteria*	*Propionibacteriaceae*	*Acidipropionibacterium*	*Acidipropionibacterium thoenii*		Dairy	Yee, A.L., Maillard, M.B., Roland, N., Chuat, V., Leclerc, A., Pogačić, T., Valence, F., Thierry, A. (2014). Great interspecies and intraspecies diversity of dairy propionibacteria in the production of cheese aroma compounds. Int J Food Microbiol. 2014 Nov 17;191:60-8. doi: 10.1016/j.ijfoodmicro.2014.09.001. Epub 2014 Sep 6. PMID: 25233451. Darilmaz, D.O., Beyatli, Y. (2012). Acid-bile, antibiotic resistance and inhibitory properties of propionibacteria isolated from Turkish traditional home-made cheeses. Anaerobe. 2012 Feb;18(1):122-7. doi: 10.1016/j.anaerobe.2011.10.002. Epub 2011 Oct 14. PMID: 22019987. Britz, T.J., Riedel, K.H. (1994). Propionibacterium species diversity in Leerdammer cheese. Int J Food Microbiol. 1994 Jun;22(4):257-67. doi: 10.1016/0168-1605(94)90177-5. PMID: 7986677	NCFB 568 DSM 20276 ATCC 4874	Britz, T.J., Riedel, K-H.J. (1991). A numerical taxonomic study of Propionibacterium strains from dairy sources. Journal of Applied Microbiology 71, 407–416.
Monera	*Actinobacteria*	*Propionibacteriaceae*	*Propionibacterium*	*Propionibacterium freudenreichii*	*Propionibacterium freudenreichii* subsp. *freudenreichii*	Dairy	Rabah, H., Rosa do Carmo, F.L., Jan, G. (2017). Dairy Propionibacteria: Versatile Probiotics. Microorganisms. 2017 May 13;5(2):24. doi: 10.3390/microorganisms5020024. PMID: 28505101; PMCID: PMC5488095. Dherbécourt, J., Falentin, H., Canaan, S., Thierry, A. (2008). A genomic search approach to identify esterases in Propionibacterium freudenreichii involved in the formation of flavour in Emmental cheese. Microb Cell Fact. 2008 May 22;7:16. doi: 10.1186/1475-2859-7-16. PMID: 18498642; PMCID: PMC2442053 Darilmaz, D.O., Beyatli, Y. (2012). Acid-bile, antibiotic resistance and inhibitory properties of propionibacteria isolated from Turkish traditional home-made cheeses. Anaerobe. 2012 Feb;18(1):122-7. doi: 10.1016/j.anaerobe.2011.10.002. Epub 2011 Oct 14. PMID: 22019987	ATCC 6207 DSM 20271	Moore, W.E.C., Holdeman, L.V. (1974). Propionibacterium. In: Buchanan, R.E., Gibbons, N.E. (Eds.), Bergey's Manual of Determinative Bacteriology, 8th ed. Williams & Wilkins. Baltimore, MD. 633–644.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Actinobacteria*	*Propionibacteriaceae*	*Propionibacterium*	*Propionibacterium freudenreichii*	*Propionibacterium freudenreichii* subsp.*shermanii*	Dairy	Rabah, H., Rosa do Carmo, F.L., Jan, G. (2017). Dairy Propionibacteria: Versatile Probiotics. Microorganisms. 2017 May 13;5(2):24. doi: 10.3390/microorganisms5020024. PMID: 28505101; PMCID: PMC5488095. Dherbécourt, J., Falentin, H., Canaan, S., Thierry, A. (2008). A genomic search approach to identify esterases in Propionibacterium freudenreichii involved in the formation of flavour in Emmental cheese. Microb Cell Fact. 2008 May 22;7:16. doi: 10.1186/1475-2859-7-16. PMID: 18498642; PMCID: PMC2442053	ATCC 9614 DSM 4902	Moore, W.E.C., Holdeman, L.V. (1974). Propionibacterium. In: Buchanan, R.E., Gibbons, N.E. (Eds.), Bergey's Manual of Determinative Bacteriology, 8th ed. Williams & Wilkins. Baltimore, MD. 633–644.
Monera	*Actinobacteria*	*Streptomycetaceae*	*Streptomyces*	*Streptomyces griseus*	*Streptomyces griseus* subsp. *griseus*	Meat	Hammes, W.P., Knauf, H.J. (1994). Starter in the processing of meat products. Meat Science 36, 155-168. Candogan, K., Wardlaw, F.B., Acton, J.C. (2009). Effect of starter cultures on proteolytic changes during processing. Food Chemistry 116, 731-737.	ATCC 23345 - DSM 40226 - ATCC 11009 - ATCC 23882	Waksman, S.A., Henrici, A.T. (1943). The nomenclature and classification of the actinomycetes. J. Bacteriol. 46, 337–341.
Monera	*Firmicutes*	*Bacillaceae*	*Bacillus*	*Bacillus amyloliquefaciens*		Seafood	Zaman, M.Z. (2011). Novel starter cultures to inhibit biogenic amines accumulation during fish sauce fermentation. Int J Food Microbiol 145(1):84-91.	ATCC 23350	Priest, F.G., Goodfellow, M., Shute, L.A., Berkeley, R.C.W. (1987). Bacillus amyloliquefaciens sp. nov., nom. Rev. Int J Syst Bacteriol 37, 69-71
Monera	*Firmicutes*	*Bacillaceae*	*Weizmannia*	*Weizmannia coagulans*		Plant Based	Schwan, R.F., Vanetti, M.C.D., Silva, D.O., Lopez, A., de Moraes, C.A. (1986). Characterization and distribution of aerobic, spore-forming bacteria from cacao fermentations in Bahia. J. Food Sci. 51:1583–1584.	ATCC 7050	Gupta, R.S., Patel, S., Saini, N., Chen, S. (2020). Robust demarcation of 17 distinct Bacillus species clades, proposed as novel Bacillaceae genera, by phylogenomics and comparative genomic analyses: description of Robertmurraya kyonggiensis sp. nov. and proposal for an emended genus Bacillus limiting it only to the members of the Subtilis and Cereus clades of species. Int J Syst Evol Microbiol. 2020 Nov;70(11):5753-5798. doi: 10.1099/ijsem.0.004475. Epub 2020 Oct 27. Erratum in: Int J Syst Evol Microbiol. 2020 Dec;70(12):6531-6533. PMID: 33112222.
Monera	*Firmicutes*	*Bacillaceae*	*Bacillus*	*Bacillus licheniformis*		Alcoholic Beverages	Wang, P., Wu, Q., Jiang, X.J., Wang, Z.Q., Tang, J.L., Xu, Y. (2017). Bacillus licheniformis affects the microbial community and metabolic profile in the spontaneous fermentation of Daqu starter for Chinese liquor making[J]. International Journal of Food Microbiology,250. Meng, X., Wu, Q., Wang, L. (2015). Improving flavor metabolism of Saccharomyces cerevisiae by mixed culture with Bacillus licheniformis for Chinese Maotai-flavor liquor making[J]. J Ind Microbiol Biotechnol. 42: 1601-8.	ATCC 14580	Chester, F.D. (1901). A Manual of Determinative Bacteriology. The MacMillan Co., New York, 1901. Wang, L.T., Lee, F.L., Tai, C.J, et al. (2007). Comparison of gyrB gene sequences, 16S rRNA gene sequences and DNA-DNA hybridization in the Bacillus subtilis group[J]. International Journal of Systematic & Evolutionary Microbiology, 2007, 57(8):1846-1850.
Monera	*Firmicutes*	*Bacillaceae*	*Bacillus*	*Bacillus licheniformis*		Plant Based	Hao, B.X., Song, L.I., Tian, H.X., Yue, M.A., Liu, H.X., Wang, C.L. (2018). Research Progress of Fermented Microbes in Pu-erh Tea[J]. Food Research and Development,39(08):203-206. (in Chinese) LI, C.C., Lv, J., Yang, R.J. (2012). Isolation and identification of thermophilic bacteria during the pile-fermentation of Pu'er tea[J]. Journal of Beijing University of Chemical Technology(Natural Science Edition), 39(02):74-78. (in Chinese)	ATCC 14580	Chester, F.D. (1901). A Manual of Determinative Bacteriology. The MacMillan Co., New York, 1901. Wang, L.T., Lee, F.L., Ta,i C.J. et al. (2007). Comparison of gyrB gene sequences, 16S rRNA gene sequences and DNA-DNA hybridization in the Bacillus subtilis group[J]. International Journal of Systematic & Evolutionary Microbiology, 2007, 57(8):1846-1850.
Monera	*Firmicutes*	*Bacillaceae*	*Bacillus*	*Bacillus subtilis*		Plant Based	Nagami, Y., Tanaka, T. (1986). Molecular cloning and nucleotide sequence of a DNA fragment from Bacillus natto that enhances production of extracellular proteases and levansucrase in Bacillus subtilis. J Bacteriol. 166, 20-8.	ATCC 6051	Gibson, T., Gordon, R. (1974). Endospore-forming rods and cocci. Family I. Bacillacea, genus I. Bacillus Cohn, p. 529-550. In: Buchanan, R.E., Gibsons, N.E. (Eds.), Bergey's manual of determinative bacteriology, 8th ed. The Williams & Wilkins Co., Baltimore.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Bacillaceae*	*Bacillus*	*Bacillus subtilis*		Meat	Wang, J., Fung, D.Y. (1996). Alkaline-fermented foods: a review with emphasis on pidan fermentation. Crit Rev Microbiol. 22, 101-38	ATCC 6051	Gibson, T., Gordon, R. (1974). Endospore-forming rods and cocci. Family I. Bacillacea, genus I. Bacillus Cohn, p. 529-550. In: Buchanan, R.E., Gibsons, N.E. (Eds.), Bergey's manual of determinative bacteriology, 8th ed. The Williams & Wilkins Co., Baltimore.
Monera	*Firmicutes*	*Bacillaceae*	*Bacillus*	*Bacillus subtilis*		Dairy	Ottogalli, G., Galli, A., Resmini, P., Volonterio, G. (1973). Composizione microbiologica, chimica ed ultrastruttura dei granuli di Kefir. Ann. Microbiol., 23, 109.	ATCC 6051	Gibson, T., Gordon, R. (1974). Endospore-forming rods and cocci. Family I. Bacillacea, genus I. Bacillus Cohn, p. 529-550. In: Buchanan, R.E., Gibsons, N.E. (Eds.), Bergey's manual of determinative bacteriology, 8th ed. The Williams & Wilkins Co., Baltimore.
Monera	*Firmicutes*	*Carnobacteriaceae*	*Carnobacterium*	*Carnobacterium divergens*		Dairy	Hammes, W.P., Hertel, C. (2009). Carnobacterium. In: De Vos, P., Schleifer, K-H., Ludwig, W., Whitman, W.B., Garrity, G., Jones, D., Rainey, F., Krieg, N.R. (Eds.), Bergey's Manual of Systematic Bacteriology, Volume 3, The Firmicutes; p.p. 549 - 557, Springer	ATCC 35677	Collins, M.D., Farrow, J.A.E., Phillips, B.A., Feresu, S., Jones, D. (1987). Classification of Lactobacillus divergens, Lactobacillus piscicola, and some catalase-negative, asporogenous, rod-shaped bacteria from poultry in a new genus, Carnobacterium. Int. J. Syst. Bacteriol. 37, 310-316.
Monera	*Firmicutes*	*Carnobacteriaceae*	*Carnobacterium*	*Carnobacterium divergens*		Meat	Leisner, J.J., Laursen, B.G., Prevost, H., Drider, D., Dalgaard, P. (2007). Carnobacterium: positive and negative ejects in the environment and in foods. FEMS Microbiol Rev. 114:168–186	ATCC 35677	Collins, M.D., Farrow, J.A.E., Phillips, B.A., Feresu, S., Jones, D. (1987). Classification of Lactobacillus divergens, Lactobacillus piscicola, and some catalase-negative, asporogenous, rod-shaped bacteria from poultry in a new genus, Carnobacterium. Int. J. Syst. Bacteriol. 37, 310-316.
Monera	*Firmicutes*	*Carnobacteriaceae*	*Carnobacterium*	*Carnobacterium divergens*		Seafood	Leisner, J.J., Laursen, B.G., Prevost, H., Drider, D., Dalgaard, P. (2007). Carnobacterium: positive and negative ejects in the environment and in foods. FEMS Microbiol Rev. 114:168–186	ATCC 35677	Collins, M.D., Farrow, J.A.E., Phillips, B.A., Feresu, S., Jones, D. (1987). Classification of Lactobacillus divergens, Lactobacillus piscicola, and some catalase-negative, asporogenous, rod-shaped bacteria from poultry in a new genus, Carnobacterium. Int. J. Syst. Bacteriol. 37, 310-316.
Monera	*Firmicutes*	*Carnobacteriaceae*	*Carnobacterium*	*Carnobacterium maltaromaticum*		Dairy	Afzal, M.I., Jacquet, T., Delaunay, S., Borges, F., Millière, J.B., Revol-Junelles, A.M., Cailliez-Grimal, C. (2010). Carnobacterium maltaromaticum: identification, isolation tools, ecology and technological aspects in dairy products. Food Microbiol. 27, 573-9.	ATCC 27865	Mora, D., Scarpellini, M., Franzetti, L., Colombo, S., Galli, A. (2003). Reclassification of Lactobacillus maltaromicus (Miller et al. 1974) DSM 20342T and DSM 20344 and Carnobacterium piscicola (Collins et al. 1987) DSM 20730T and DSM 20722 as Carnobacterium maltaromaticum comb. nov. Int. J. Syst. Evol. Microbiol. 53, 675-678.
Monera	*Firmicutes*	*Carnobacteriaceae*	*Carnobacterium*	*Carnobacterium mobile*		Dairy	Retureau, E., Callon, C., Didienne, R., Montel, MC. (2010). Is microbial diversity an asset for inhibiting Listeria monocytogenes in raw milk cheeses? Dairy Science & Technology. 90, 375-398.	ATCC 49516	Collins M.D., Farrow J.A.E., Phillips B.A., Feresu S. and Jones D. (1987). Classification of Lactobacillus divergens, Lactobacillus piscicola, and some catalase-negative, asporogenous, rod-shaped bacteria from poultry in a new genus, Carnobacterium. Int. J. Syst. Bacteriol. 37,310-316.
Monera	*Firmicutes*	*Carnobacteriaceae*	*Carnobacterium*	*Carnobacterium divergens*		Plant Based	Nyanga, L.K., Nout, M.J.R., Gadaga, T.H., Theelen, B., Boekhout, T., Zwietering, M.H. (2007). Yeasts and lactic acid bacteria microbiota from masau (Ziziphus mauritiana) fruits and their fermented fruit pulp in Zimbabwe. Int J Food Microbiol. 120: 159-66.	ATCC 35677	Collins, M.D., Farrow, J.A.E., Phillips, B.A., Feresu, S., Jones, D. (1987). Classification of Lactobacillus divergens, Lactobacillus piscicola, and some catalase-negative, asporogenous, rod-shaped bacteria from poultry in a new genus, Carnobacterium. Int. J. Syst. Bacteriol. 37, 310-316.
Monera	*Firmicutes*	*Carnobacteriaceae*	*Carnobacterium*	*Carnobacterium maltaromaticum*		Seafood	Pilet, M-F., Dousset, X., Barré, R., Novel, G., Desmazeaud, M., Piard, J-C. (1995). Evidence for Two Bacteriocins Produced by Carnobacterium piscicola and Carnobacterium divergens Isolated from Fish and Active Against Listeria monocytogenes. J Food Prot. 58: 256-262.	ATCC 27865	Mora, D., Scarpellini, M., Franzetti, L., Colombo, S., Galli, A. (2003). Reclassification of Lactobacillus maltaromicus (Miller et al. 1974) DSM 20342T and DSM 20344 and Carnobacterium piscicola (Collins et al. 1987) DSM 20730T and DSM 20722 as Carnobacterium maltaromaticum comb. nov. Int. J. Syst. Evol. Microbiol. 53, 675-678.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Carnobacteriaceae*	*Carnobacterium*	*Carnobacterium maltaromaticum*		Meat	Ahn, C., Stiles, M.E. (1990). Plasmid-associated bacteriocin production by a strain of Carnobacterium piscicola from meat. Appl Environ Microbiol. 56: 2503-10.	ATCC 27865	Mora, D., Scarpellini, M., Franzetti, L., Colombo, S., Galli, A. (2003). Reclassification of Lactobacillus maltaromicus (Miller et al. 1974) DSM 20342T and DSM 20344 and Carnobacterium piscicola (Collins et al. 1987) DSM 20730T and DSM 20722 as Carnobacterium maltaromaticum comb. nov. Int. J. Syst. Evol. Microbiol. 53, 675-678.
Monera	*Firmicutes*	*Carnobacteriaceae*	*Marinilactibacillus*	*Marinilactibacillus psychrotolerans*		Dairy	Ishikawa, M., Kodama, K., Yasuda, H., Okamoto-Kainuma, A., Koizumi, K., Yamasato, K. (2007). Presence of halophilic and alkaliphilic lactic acid bacteria in various cheeses. Lett Appl Microbiol. 44,308-13.	NCIMB 13873 IAM 14980 DSMZ 19582 NBRC 100002	Ishikawa, M., Nakajima, K., Yanagi, M., Yamamoto, Y. and Yamasato, K. (2003). Marinilactibacillus psychrotolerans gen. nov., sp. nov., a halophilic and alkaliphilic marine lactic acid bacterium isolated from marine organisms in temperate and subtropical areas of Japan. Int. J. Syst. Evol. Microbiol. 53,711-720.
Monera	*Firmicutes*	*Carnobacteriaceae*	*Marinilactibacillus*	*Marinilactibacillus psychrotolerans*		Seafood	Belleggia, L., Aquilanti, L., Ferrocino, I., Milanović, V., Garofalo, C., Clementi, F., Cocolin, L., Mozzon, M., Foligni, R., Haouet, M.N., Scuota, S., Framboas, M., Osimani, A. (2020). Discovering microbiota and volatile compounds of surströmming, the traditional Swedish sour herring. Food Microbiol. 2020 Oct;91:103503. doi: 10.1016/j.fm.2020.103503. Epub 2020 Apr 9. PMID: 32539969	NCIMB 13873 IAM 14980 DSMZ 19582 NBRC 100002	Ishikawa, M., Nakajima, K., Yanagi, M., Yamamoto, Y. and Yamasato, K. (2003). Marinilactibacillus psychrotolerans gen. nov., sp. nov., a halophilic and alkaliphilic marine lactic acid bacterium isolated from marine organisms in temperate and subtropical areas of Japan. Int. J. Syst. Evol. Microbiol. 53,711-720.
Monera	*Firmicutes*	*Carnobacteriaceae*	*Marinilactibacillus*	*Marinilactibacillus psychrotolerans*		Plant Based	Lucena-Padrós, H., Ruiz-Barba, J.L. (2019). Microbial biogeography of Spanish-style green olive fermentations in the province of Seville, Spain. Food Microbiol. 2019 Sep;82:259-268. doi: 10.1016/j.fm.2019.02.004. Epub 2019 Feb 20. PMID: 31027782.	NCIMB 13873 IAM 14980 DSMZ 19582 NBRC 100002	Ishikawa, M., Nakajima, K., Yanagi, M., Yamamoto, Y. and Yamasato, K. (2003). Marinilactibacillus psychrotolerans gen. nov., sp. nov., a halophilic and alkaliphilic marine lactic acid bacterium isolated from marine organisms in temperate and subtropical areas of Japan. Int. J. Syst. Evol. Microbiol. 53,711-720.
Monera	*Firmicutes*	*Clostridiaceae*	*Clostridium*	*Clostridium kluyveri*		Alcoholic Beverages	Yan, S., Wang, S., Qiu, Z., Wei, G., & Zhang, K. (2015). Optimization of Caproic Acid Production from Clostridium kluyveri H588 and its Application in Chinese Luzhou-flavor Liquor Brewing[J]. Advanced Journal of Food Science & Technology, 7(8): 614-626. Wang, Y., Li, B., Dong, H. (2018), Complete Genome Sequence of Clostridium kluyveri JZZ Applied in Chinese Strong-Flavor Liquor Production. Curr Microbiol,75(11): 1429-1433.	ATCC 8527	Barker, H.A., Taha, S.M. (1942) Clostridium kluyverii, an Organism Concerned in the Formation of Caproic Acid from Ethyl Alcohol[J]. J Bacteriol, 1942, 43:347-363. Knabel, S., Tatzel, R., Ludwig, W, et al. (1997). Identification of Clostridium butyricum, Clostridium sporogenes and Clostridium tyrobutyricum by Hybridization with 16S rRNA_targeted Oligonucleotide Probes[J]. Syst Appl Microbiol, 1997, 20(1):85-88.
Monera	*Firmicutes*	*Clostridiaceae*	*Clostridium*	*Clostridium tyrobutyricum*		Alcoholic Beverages	Tian, Y., Heng, X.C., Zou, W. (2019). Isolation and identification of clostridia from the pit mud of Strong-flavor Baijiu and comparative study on butyric acid production[J]. Food and Fermentation Industries, 45:60-65. (in Chinese)	ATCC 25755	Van Beynum, J., Pette, J.W. (1935). Zuckervergärend und Laktat vergärende Buttersäurebakterien. Zentralblatt für Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene, Abteilung II, 1935, 93:198-212. Mukherjee, S., Seshadri, R., Varghese, N.J. et al. (2017). 1,003 reference genomes of bacterial and archaeal isolates expand coverage of the tree of life[J]. Nat Biotechnol, 2017, 35:676-683.
Monera	*Firmicutes*	*Enterococcaceae*	*Enterococcus*	*Enterococcus durans*		Dairy	De Angelis, M. (2008). Selection and use of autochthonous multiple strain cultures for the manufacture of high-moisture traditional Mozzarella cheese. International Journal of Food Microbiology 125, 123–132.	ATCC 19432	Sherman, J.M., Wing, H.U. (1937). Streptococcus durans N. Sp. Jour. Dairy Sci. 20, 165-167.
Monera	*Firmicutes*	*Enterococcaceae*	*Enterococcus*	*Enterococcus durans*		Bakery	Miguel Rocha, J., Xavier Malcata, F. (1999). On the Microbiological Profile of Traditional Portuguese Sourdough. Journal of Food Protection 62, 1416–1429	ATCC 19432	Sherman, J.M., Wing, H.U. (1937). Streptococcus durans N. Sp. Jour. Dairy Sci. 20, 165-167.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Enterococcaceae*	*Enterococcus*	*Enterococcus faecalis*		Dairy	Foulquie´ Moreno, M.R., Sarantinopoulos, P., Tsakalidou, E., Vuyst, L. De. (2006). The role and application of enterococci in food and health. International Journal of Food Microbiology 106, 1-24.	ATCC 19433	Schleifer, K.H., Kilpper-Balz, R. (1984). Transfer of Streptococcus faecalis and Streptococcus faecium to the genus Enterococcus nom. rev. as Enterococcus faecalis comb. nov. and Enterococcus faecium comb. nov. Int. J. Syst. Bacteriol. 34, 31-34.
Monera	*Firmicutes*	*Enterococcaceae*	*Enterococcus*	*Enterococcus faecalis*		Meat	Foulquie´ Moreno, M.R., Sarantinopoulos, P., Tsakalidou, E., Vuyst, L. De. (2006). The role and application of enterococci in food and health. International Journal of Food Microbiology 106, 1-24.	ATCC 19433	Schleifer, K.H., Kilpper-Balz, R. (1984). Transfer of Streptococcus faecalis and Streptococcus faecium to the genus Enterococcus nom. rev. as Enterococcus faecalis comb. nov. and Enterococcus faecium comb. nov. Int. J. Syst. Bacteriol. 34, 31-34.
Monera	*Firmicutes*	*Enterococcaceae*	*Enterococcus*	*Enterococcus faecalis*		Plant Based	Foulquie´ Moreno, M.R., Sarantinopoulos, P., Tsakalidou, E., Vuyst, L. De. (2006). The role and application of enterococci in food and health. International Journal of Food Microbiology 106, 1-24.	ATCC 19433	Schleifer, K.H., Kilpper-Balz, R. (1984). Transfer of Streptococcus faecalis and Streptococcus faecium to the genus Enterococcus nom. rev. as Enterococcus faecalis comb. nov. and Enterococcus faecium comb. nov. Int. J. Syst. Bacteriol. 34, 31-34.
Monera	*Firmicutes*	*Enterococcaceae*	*Enterococcus*	*Enterococcus faecalis*		Plant Based	Foulquie´ Moreno, M.R., Sarantinopoulos, P., Tsakalidou, E., Vuyst, L. De. (2006). The role and application of enterococci in food and health. International Journal of Food Microbiology 106, 1-24.	ATCC 19433	Schleifer, K.H., Kilpper-Balz, R. (1984). Transfer of Streptococcus faecalis and Streptococcus faecium to the genus Enterococcus nom. rev. as Enterococcus faecalis comb. nov. and Enterococcus faecium comb. nov. Int. J. Syst. Bacteriol. 34, 31-34.
Monera	*Firmicutes*	*Enterococcaceae*	*Enterococcus*	*Enterococcus faecium*		Dairy	Foulquie´ Moreno, M.R., Sarantinopoulos, P., Tsakalidou, E., Vuyst, L. De. (2006). The role and application of enterococci in food and health. International Journal of Food Microbiology 106, 1-24.	ATCC 19434	Orla-Jensen, S. (1924). La classification des bactéries lactiques. Lait 4, 468–474.
Monera	*Firmicutes*	*Enterococcaceae*	*Enterococcus*	*Enterococcus faecium*		Meat	Foulquie´ Moreno, M.R., Sarantinopoulos, P., Tsakalidou, E., Vuyst, L. De. (2006). The role and application of enterococci in food and health. International Journal of Food Microbiology 106, 1-24.	ATCC 19434	Orla-Jensen, S. (1924). La classification des bactéries lactiques. Lait 4, 468–474.
Monera	*Firmicutes*	*Enterococcaceae*	*Enterococcus*	*Enterococcus faecium*		Plant Based	Foulquie´ Moreno, M.R., Sarantinopoulos, P., Tsakalidou, E., Vuyst, L. De. (2006). The role and application of enterococci in food and health. International Journal of Food Microbiology 106, 1-24.	ATCC 19434	Orla-Jensen, S. (1924). La classification des bactéries lactiques. Lait 4, 468–474.
Monera	*Firmicutes*	*Enterococcaceae*	*Enterococcus*	*Enterococcus faecium*		Plant Based	Foulquie´ Moreno, M.R., Sarantinopoulos, P., Tsakalidou, E., Vuyst, L. De. (2006). The role and application of enterococci in food and health. International Journal of Food Microbiology 106, 1-24.	ATCC 19434	Orla-Jensen, S. (1924). La classification des bactéries lactiques. Lait 4, 468–474.
Monera	*Firmicutes*	*Enterococcaceae*	*Tetragenococcus*	*Tetragenococcus halophilus*		Plant Based	Noda, F., Hayashi, K., Mizunuma, T. (1980). Antagonism Between Osmophilic Lactic Acid Bacteria and Yeasts in Brine Fermentation of Soy Sauce. Appl Environ Microbiol. 40, 452-457. Nishimura, I., Igarashi, T., Enomoto, T., Dake, Y., Okuno, Y., Obata, A. (2009). Clinical efficacy of halophilic lactic acid bacterium Tetragenococcus halophilus Th221 from soy sauce moromi for perennial allergic rhinitis. Allergol Int. 58:179-85.	ATCC 33315 DSM 20339	Anon. (1994). Validation of the Publication of New Names and New Combinations Previously Effectively Published Outside the IJSB List No. 49. Int. J. Syst. Bacteriol. 44: 370 - 371 Collins, M.D., Williams, A.M., Wallbanks, S. (1990). The phylogeny of Aerococcus and Pediococcus as determined by 16S rRNA sequence analysis: description of Tetragenococcus gen. nov. FEMS Microbiol Lett. 58, 255-62.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Enterococcaceae*	*Tetragenococcus*	*Tetragenococcus halophilus*		Seafood	Belleggia, L., Aquilanti, L., Ferrocino, I., Milanović, V., Garofalo, C., Clementi, F., Cocolin, L., Mozzon, M., Foligni, R., Haouet, M.N., Scuota, S., Framboas, M., Osimani, A. (2020). Discovering microbiota and volatile compounds of surströmming, the traditional Swedish sour herring. Food Microbiol. 2020 Oct;91:103503. doi: 10.1016/j.fm.2020.103503. Epub 2020 Apr 9. PMID: 32539969. Song, E.J., Lee, E.S., Park, S.L., Choi, H.J., Roh, S.W., Nam, Y.D. (2018). Bacterial community analysis in three types of the fermented seafood, jeotgal, produced in South Korea. Biosci Biotechnol Biochem. 2018 Aug;82(8):1444-1454. doi: 10.1080/09168451.2018.1469395. Epub 2018 May 9. PMID: 29742980. Satomi, M., Furushita, M., Oikawa, H., Yoshikawa-Takahashi, M., Yano, Y. (2008). Analysis of a 30 kbp plasmid encoding histidine decarboxylase gene in Tetragenococcus halophilus isolated from fish sauce. Int J Food Microbiol. 2008 Aug 15;126(1-2):202-9. doi: 10.1016/j.ijfoodmicro.2008.05.025. Epub 2008 May 25. PMID: 18573560.	ATCC 33315 DSM 20339	Anon. (1994). Validation of the Publication of New Names and New Combinations Previously Effectively Published Outside the IJSB List No. 49. Int. J. Syst. Bacteriol. 44: 370 - 371 Collins, M.D., Williams, A.M., Wallbanks, S. (1990). The phylogeny of Aerococcus and Pediococcus as determined by 16S rRNA sequence analysis: description of Tetragenococcus gen. nov. FEMS Microbiol Lett. 58, 255-62.
Monera	*Firmicutes*	*Enterococcaceae*	*Tetragenococcus*	*Tetragenococcus koreensis*		Meat	Amadoro, C., Rossi, F., Piccirilli, M., Colavita, G. (2015). Tetragenococcus koreensis is part of the microbiota in a traditional Italian raw fermented sausage. Food Microbiol. 2015 Sep;50:78-82. doi: 10.1016/j.fm.2015.03.011. Epub 2015 Apr 8. PMID: 25998818. Lee, M., Kim, M.K., Vancanneyt, M., Swings, J., Kim, S.H., Kang, M.S., Lee, S.T. (2005). Tetragenococcus koreensis sp. nov., a novel rhamnolipid-producing bacterium. Int. J. Syst. Evol. Microbiol. 55, 1409-1413.	DSM 16501	Lee, M., Kim, M.K., Vancanneyt, M., Swings, J., Kim, S.H., Kang,. M.S., Lee, S.T. (2005). Tetragenococcus koreensis sp. nov., a novel rhamnolipid-producing bacterium. Int. J. Syst. Evol. Microbiol. 55, 1409-1413.
Monera	*Firmicutes*	*Lactobacillaceae*	*Agrilactobacillus*	*Agrilactobacillus composti*		Alcoholic Beverages	Endo, A., Okada, S. (2007). Lactobacillus composti sp. nov., a lactic acid bacterium isolated from a compost of distilled shochu residue. Int. J. Syst. Evol. Microbiol., 57, 870-872. NRIC 0689	NRIC 0689	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus alimentarius*		Bakery	Fujimoto, A., Ito, K., Narushima, N., Miyamoto, T. (2019). Identification of lactic acid bacteria and yeasts, and characterization of food components of sourdoughs used in Japanese bakeries. J Biosci Bioeng. 2019 May;127(5):575-581.	ATCC 29643	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus alimentarius*		Alcoholic Beverages	Huang, Z.R., Guo, W.L., Zhou, W.B., Li, L., Xu, J.X., Hong, J.L., Liu, H.P., Zeng, F., Bai, W.D., Liu, B., Ni, L., Rao, P.F., Lv, X.C. (2019). Microbial communities and volatile metabolites in different traditional fermentation starters used for Hong Qu glutinous rice wine. Food Res Int. 2019 Jul;121:593-603	ATCC 29643	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004108
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus alimentarius*		Dairy	Cardinali, F., Osimani, A., Taccari, M., Milanović, V., Garofalo, C., Clementi, F., Polverigiani, S., Zitti, S., Raffaelli, N., Mozzon, M., Foligni, R., Franciosi, E., Tuohy, K., Aquilanti, L. (2017). Impact of thistle rennet from Carlina acanthifolia All. subsp. acanthifolia on bacterial diversity and dynamics of a specialty Italian raw ewes' milk cheese. Int J Food Microbiol. 2017 Aug 16;255:7-16.	ATCC 29643	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004109

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus alimentarius*		Meat	García Fontán, M.C. (2007). Microbiological characteristics of androlla, a Spanish traditional pork sausage. Food Microbiol. 24, 52-8.	ATCC 29643	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus alimentarius*		Seafood	Paludan-Müller, C., Madsen, M., Sophanodora, P., Gram, L., Lange Møller, P. (2002). Fermentation and microflora of plaa-som, a thai fermented fish product prepared with different salt concentrations. Int J Food Microbiol 25;73(1):61-70	ATCC 29643	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus alimentarius*		Plant Based	Yalçınkaya, S., Kılıç, G.B. (2019). Isolation, identification and determination of technological properties of the halophilic lactic acid bacteria isolated from table olives. J Food Sci Technol. 2019 Apr;56(4):2027-2037. doi: 10.1007/s13197-019-03679-9. Epub 2019 Mar 6. PMID: 30996437; PMCID: PMC6443818.	ATCC 29643	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus crustorum*		Meat	Lu, Y., Aizhan, R., Yan, H., Li, X., Wang, X., Yi, Y., Shan, Y., Liu, B., Zhou, Y., Lü, X. (2020). Characterization, modes of action, and application of a novel broad-spectrum bacteriocin BM1300 produced by Lactobacillus crustorum MN047. Braz J Microbiol. 2020 Dec;51(4):2033-2048.	LMG 23699	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus crustorum*		Bakery	Ravyts, F., De Vuyst, L. (2011). Prevalence and impact of single-strain starter cultures of lactic acid bacteria on metabolite formation in sourdough. Food Microbiol 28(6):1129-39.	LMG 23699	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus farciminis*		Seafood	Tanasupawat, S., Okada, S., Komagata, K. (1998). Lactic acid bacteria found in fermented fish in Thailand J. Gen Appl. Microbiol. 44(3):193-200	ATCC 29644	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus farciminis*		Meat	Samelis, J., Maurogenakis, F. and Metaxopoulos, J. (1994). Characterisation of lactic acid bacteria isolated from naturally fermented Greek dry salami. Int. J. Food Microbiol., 23, 179-196.	ATCC 29644	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus farciminis*		Plant Based	Chao, S.H. et al. (2008). Diversity of lactic acid bacteria in fermented brines used to make stinky tofu. Int. J. Food Microbiol., 123, 134-141.	ATCC 29644	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus kimchiensis*		Plant Based	Kim, J., Kim, J.Y., Kim, M.S., Roh, S.W., Bae, J.W. (2013). Lactobacillus kimchiensis sp. nov., isolated from a fermented food. Int J Syst Evol Microbiol. 2013 Apr;63(Pt 4):1355-1359.	DSM 24716	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus kimchiensis*		Alcoholic Beverages	Leech, J., Cabrera-Rubio, R., Walsh, A.M., Macori, G., Walsh, C.J., Barton, W., Finnegan, L., Crispie, F., O'Sullivan, O., Claesson, M.J., Cotter, P.D. (2020). Fermented-food metagenomics reveals substrate-associated differences in taxonomy and health-associated and antibiotic resistance	DSM 24716	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus mindensis*		Bakery	Ehrmann, M.A., Müller, M.R.A., Vogel, R.F. (2003). Molecular analysis of sourdough reveals Lactobacillus mindensis sp. nov. Int. J. Syst. Evol. Microbiol. 53, 7-13.	DSM 14500	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus nantensis*		Bakery	Valcheva, R., Ferchichi, M.F., Korakli, M., Ivanova, I., Gänzle, M.G., Vogel, R.F., Prévost, H., Onno, B., Dousset, X. (2006). Lactobacillus nantensis sp. nov., isolated from French wheat sourdough. Int. J. Syst. Evol. Microbiol. 56, 587-591.	DSM 16982	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus nodensis*		Plant Based	Kashiwagi, T., Suzuki, T., Kamakura, T. (2009). Lactobacillus nodensis sp. nov., isolated from rice bran. Int. J. Syst. Evol. Microbiol. 59, 83-86.	DSM 19682	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus nodensis*		Dairy	Masoud, W., Takamiya, M., Vogensen, F.K., Lillevang, S., Al-Soud, W.A., Sørensen, S.J., Jakobsen, M. (2010). Characterization of bacterial populations in Danish raw milk cheeses made with different starter cultures by denaturating gradient gel electrophoresis (DGGE) and pyrosequencing. International Dairy Journal 21, 142-148.	DSM 19682	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus paralimentarius*		Bakery	Cai, Y., Okada, H., Mori, H., Benno, Y., Nakase, T. (1999). Lactobacillus paralimentarius sp. nov., isolated from sourdough. Int. J. Syst. Bacteriol. 49, 1451-1455.	JCM 10415	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus tucceti*		Dairy	Masoud, W., Takamiya, M., Vogensen, F.K., Lillevang, S., Al-Soud, W.A., Sørensen, S.J., Jakobsen, M. (2010). Characterization of bacterial populations in Danish raw milk cheeses made with different starter cultures by denaturating gradient gel electrophoresis (DGGE) and pyrosequencing. International Dairy Journal 21, 142-148.	DSM 20183	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus tucceti*		Meat	Chenoll, E., Macian, M.C., Aznar, R. (2006). Lactobacillus tucceti sp. nov., a new lactic acid bacterium isolated from sausage. Syst. Appl. Microbiol. 29, 389-395.	DSM 20183	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus versmoldensis*		Dairy	El-Baradei, G., Delacroix-Buchet, A., Ogier, J.C. (2007). Biodiversity of bacterial ecosystems in traditional Egyptian Domiati cheese. Appl Environ Microbiol. 2007 Feb;73(4):1248-55. doi: 10.1128/AEM.01667-06.	DSM 14857	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Companilactobacillus*	*Companilactobacillus versmoldensis*		Meat	Kröckel, L., Schillinger, U., Franz, C.M.A.P., Bantleon, A., Ludwig, W. (2003). Lactobacillus versmoldensis sp. nov., isolated from raw fermented sausage. Int. J. Syst. Evol. Microbiol. 53, 513-517.	DSM 14857	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Fructilactobacillus*	*Fructilactobacillus fructivorans*		Alcoholic Beverages	Pardo, I. and Zuniga, M. (1992). Lactic Acid Bacteria in Spanish Red Rose and White Musts and Wines, Journal of Food Science 57 No. 2, p392-397	ATCC 8288	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Fructilactobacillus*	*Fructilactobacillus fructivorans*		Bakery	Vogel, R.F., Böcker, G., Stolz, P., Ehrmann, M., Fanta, D., Ludwig, W., Pot, B., Kersters, K., Schleifer, K.H., Hammes, W.P. (1994). Identification of lactobacilli from sourdough and description of Lactobacillus pontis sp. nov. Int. J. Syst. Bacteriol. 44, 223-229.	ATCC 8288	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Fructilactobacillus*	*Fructilactobacillus fructivorans*		Alcoholic Beverages	Kitahara, K., Kaneto, T., Goto, O. (1957). Taxonomic studies on the hiochi-bacteria, specific saprophytes of sake. II. Identification and classification of hiochi-bacteria. Journal of General and Applied Microbiology 3, 111-120.	ATCC 8288	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Fructilactobacillus*	*Fructilactobacillus sanfranciscensis*		Bakery	Vogel, R.F. (1999). Non-dairy lactic fermentations: the cereal world. Antonie Van Leeuwenhoek 76(1-4), 403-11.	ATCC 27651	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Furfurilactobacillus*	*Furfurilactobacillus rossiae*		Bakery	Corsetti, A., Settanni, L., Van Sinderen, D., Felis, G.E., Dellaglio, F., Gobbetti, M. (2005). Lactobacillus rossii sp. nov., isolated from wheat sourdough. Int. J. Syst. Evol. Microbiol. 55, 35-40.	DSM 15814	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Furfurilactobacillus*	*Furfurilactobacillus siliginis*		Bakery	Aslam, Z., IM, W.T., Ten, L.N., Lee, M.J., Kim, K.H., Lee, S.T. (2006). Lactobacillus siliginis sp. nov., isolated from wheat sourdough in South Korea. Int. J. Syst. Evol. Microbiol. 56, 2209-2213.	NBRC 101315	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lacticaseibacillus*	*Lacticaseibacillus casei*		Meat	Samelis, J., Maurogenakis, F., Metaxopoulos, J. (1994). Characterisation of lactic acid bacteria isolated from naturally fermented Greek dry salami. Int J Food Microbiol. 1994 Oct;23(2):179-96.	ATCC 393	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lacticaseibacillus*	*Lacticaseibacillus casei*		Plant Based	Blaiotta, G., Di Capua, M., Coppola, R., Aponte, M. (2012). Production of fermented chestnut purees by lactic acid bacteria. Int J Food Microbiol. 2012 Sep 3;158(3):195-202	ATCC 393	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lacticaseibacillus*	*Lacticaseibacillus casei*		Plant Based	Randazzo, C.L., Restuccia, C., Romano, A.D., Caggia, C. (2004). Lactobacillus casei, dominant species in naturally fermented Sicilian green olives. Int J Food Microbiol. 2004 Jan 1;90(1):9-14.	ATCC 393	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lacticaseibacillus*	*Lacticaseibacillus casei*		Dairy	Hyde, L.S. (1927). A study of some of the lactobacilli. Iowa State College	ATCC 393	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lacticaseibacillus*	*Lacticaseibacillus casei*		Alcoholic Beverages	Lonvaud-Funel, A., Joyeux, A. and Ledoux, O. (1991). Specific enumeration of lactic acid bacteria in fermenting grape must and wine by colony hybridization with non-isotopic DNA Probes, Journal of Applied Bacteriology, Vol. 71, p. 501-508	ATCC 393	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lacticaseibacillus*	*Lacticaseibacillus manihotivorans*		Bakery	Morlon-Guyot, J., Guyot, J.P., Pot, B., Jacobe de Haut, I., Raimbault, M. (1998). Lactobacillus manihotivorans sp. nov., a new starch-hydrolysing lactic acid bacterium isolated during cassava sour starch fermentation. Int. J. Syst. Bacteriol. 48, 1101-1109.	DSM 13343	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lacticaseibacillus*	*Lacticaseibacillus paracasei*	*Lacticaseibacillus paracasei* subsp. *paracasei*	Bakery	Denkova, R., Ilieva, S., Denkova, Z., Georgieva, L., Yordanova, M., Nikolova, D., Evstatieva, Y. (2014). Production of wheat bread without preservatives using sourdough starters. Biotechnol Biotechnol Equip. 2014 Sep 3;28(5):889-898.	ATCC 25302	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Lacticaseibacillus*	*Lacticaseibacillus paracasei*	*Lacticaseibacillus paracasei* subsp. *paracasei*	Alcoholic Beverages	Todovrov, S.D., Dicks, L.M.T. (2004). Screening of Lactic Acid Bacteria from South African Barley Beer for Production of Bacteriocin-like Compounds. Folia Microbiol 49 (4) 406-410	ATCC 25302	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lacticaseibacillus*	*Lacticaseibacillus paracasei*	*Lacticaseibacillus paracasei* subsp. *paracasei*	Dairy	Poveda, J.M., Nieto-Arribas, P., Seseña, S., Chión, R., Castro, L., Palo, L., Cabezas, L. (2014). Volatile composition and improvement of the aroma of industrial Manchego cheese by using Lactobacillus paracasei subsp. paracasei as adjunct and other autochthonous strains as starters. Eur Food Res Technol 238, 485–494.	ATCC 25302	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lacticaseibacillus*	*Lacticaseibacillus paracasei*	*Lacticaseibacillus paracasei* subsp. *paracasei*	Meat	Sameshima, T. (1998). Effect of intestinal Lactobacillus starter cultures on the behaviour of Staphylococcus aureus in fermented sausage. Int J Food Microbiol. 41, 1-7.	ATCC 25302	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lacticaseibacillus*	*Lacticaseibacillus paracasei*	*Lacticaseibacillus paracasei* subsp. *paracasei*	Alcoholic Beverages	Magalhães, K.T. et al. (2010). Microbial communities and chemical changes during fermentation of sugary Brazilian kefir. World J. Microbiol. Biotechnol., 26, 1241-1250. Romero-Luna, H.E. et al. (2020). Probiotic potential of lactobacillus paracasei CT12 isolated from water kefir grains (Tibicos). Curr. Microbiol., 77, 2584-2592.	ATCC 25302	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lacticaseibacillus*	*Lacticaseibacillus paracasei*	*Lacticaseibacillus paracasei* subsp. *paracasei*	Plant Based	Seseña, S. and Palop, M.Ll. (2007). An ecological study of lactic acid bacteria from Almagro eggplant fermentation brines. J. Appl. Microbiol., 103, 1553-1561. Todorov, S.D. and Dicks, L.M.T. (2006). Screening for bacteriocin-producing lactic acid bacteria from boza, a traditional cereal beverage from Bulgaria. Comparison of the bacteriocins. Process Biochem., 41, 11-19.	ATCC 25302	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lacticaseibacillus*	*Lacticaseibacillus paracasei*	*Lacticaseibacillus paracasei* subsp. *paracasei*	Plant Based	Annggriawan, R. (2017). Microbiological and food safety aspects of Tempeh prodcution in Indonesia. PhD thesis, Georg-August-University Göttingen, Germany.	ATCC 25302	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lacticaseibacillus*	*Lacticaseibacillus rhamnosus*		Plant Based	Blaiotta, G., Di Capua, M., Coppola, R., Aponte, M. (2012). Production of fermented chestnut purees by lactic acid bacteria. Int J Food Microbiol. 2012 Sep 3;158(3):195-202	ATCC 7469	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lacticaseibacillus*	*Lacticaseibacillus rhamnosus*		Dairy	Salminen, S. (1994). Healthful properties of Lactobacillus GG. Dairy Industries Int. Jan. (59).	ATCC 7469	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Lacticaseibacillus*	*Lacticaseibacillus rhamnosus*		Meat	Erkkilä, S., Suihko, M.L., Eerola. S., Petäjä, E., Mattila-Sandholm, T. (2001). Dry sausage fermented by Lactobacillus rhamnosus strains. Int. J. Food. Microbiol. Feb 28;64 (1-2): 205-210.	ATCC 7469	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lacticaseibacillus*	*Lacticaseibacillus rhamnosus*		Plant Based	Todorov, S.D. and Dicks, L.M.T. (2006). Screening for bacteriocin-producing lactic acid bacteria from boza, a traditional cereal beverage from Bulgaria. Comparison of the bacteriocins. Process Biochem., 41, 11-19.	ATCC 7469	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lacticaseibacillus*	*Lacticaseibacillus rhamnosus*		Plant Based	Oh, A., Daliri, E.B.-M. and Oh, D.H. (2018). Screening for potential probiotic bacteria from Korean fermented soybean paste: In vitro and Caenorhabditis elegans model testing. LWT, 88, 132-138.	ATCC 7469	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lacticaseibacillus*	*Lacticaseibacillus rhamnosus*		Plant Based	Lee, H., Yoon, H., Ji, Y., Kim, H.,Park, H., Lee, J., Shin, H., Holzapfel, W. (2011). Functional properties of Lactobacillus strains isolated from kimchi. Int J Food Microbiol. 145, 155-61.	ATCC 7469	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus fabifermentans*		Plant Based	De Bruyne, K., Camu, N., De Vuyst, L., Vandamme, P. (2009). Lactobacillus fabifermentans sp. nov. and Lactobacillus cacaonum sp. nov., isolated from Ghanaian cocoa fermentations. Int. J. Syst. Evol. Microbiol. 59, 7-12.	DSM 21115	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus paraplantarum*		Plant Based	Pulido, R.P., Omar, N.B., Abriouel, H., López, R.L., Cañamero, M.M., Guyot, J.P., Gálvez, A. (2007). Characterization of lactobacilli isolated from caper berry fermentations. J Appl Microbiol. 2007 Feb;102(2):583-90.	ATCC 700211	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus paraplantarum*		Plant Based	Chun, J., Kim, G.M., Lee, K.W., Choi, I.D., Kwon, G.H., Park, J.Y., Jeong, S.J., Kim, J.S., Kim, J.H. (2007). Conversion of isoflavone glucosides to aglycones in soymilk by fermentation with lactic acid bacteria. J Food Sci. 2007 Mar;72(2):M39-44.	ATCC 700211	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus paraplantarum*		Alcoholic Beverages	Mtshali, P.S., Divol, B., van Rensburg, P., du Toit, M. (2010). Genetic screening of wine-related enzymes in Lactobacillus species isolated from South African wines. J Appl Microbiol. 2010 Apr;108(4):1389-97.	ATCC 700211	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus paraplantarum*		Meat	Liu, L., Li, P. (2016). Complete genome sequence of Lactobacillus paraplantarum L-ZS9, a probiotic starter producing class II bacteriocins. J Biotechnol. 2016 Mar 20;222:15-6. doi: 10.1016/j.jbiotec.2016.02.003. Epub 2016 Feb 4. PMID: 26853479.	ATCC 700211	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus paraplantarum*		Seafood	Park, S.K., Jo, D.M., Yu, D., Khan, F., Lee, Y.B., Kim, Y.M. (2020). Reduction of Trimethylamine Off-Odor by Lactic Acid Bacteria Isolated from Korean Traditional Fermented Food and Their In Situ Application. J Microbiol Biotechnol. 2020 Oct 28;30(10):1510-1515	ATCC 700211	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus paraplantarum*		Dairy	Manolopoulou, E. (2003). Evolution of microbial populations during traditional Feta cheese manufacture and ripening. Int J Food Microbiol. 82, 153-61.	ATCC 700211	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus paraplantarum*		Plant Based	Mäkimattila, E., Kahala, M., Joutsjoki, V. (2010). Characterization and electrotransformation of Lactobacillus plantarum and Lactobacillus paraplantarum isolated from fermented vegetables. World Journal of Microbiology and Biotechnology. 27 (2): 371–379.	ATCC 700211	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus pentosus*		Meat	Con, A.H., Gökalp, H.Y. (2000). Production of bacteriocin-like metabolites by lactic acid cultures isolated from sucuk samples. Meat Sci. 2000 May;55(1):89-96	ATCC 8041	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus pentosus*		Bakery	Fujimoto, A., Ito, K., Narushima, N., Miyamoto, T. (2019). Identification of lactic acid bacteria and yeasts, and characterization of food components of sourdoughs used in Japanese bakeries. J Biosci Bioeng. 2019 May;127(5):575-581	ATCC 8041	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus pentosus*		Plant Based	Almeida, E.G., Rachid, C.C., Schwan, R.F. (2007). Microbial population present in fermented beverage 'cauim' produced by Brazilian Amerindians. Int J Food Microbiol. 2007 Nov 30;120(1-2):146-51.	ATCC 8041	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus pentosus*		Alcoholic Beverages	Todovrov, S.D., Dicks, L.M.T. (2004). Rev Latinoam Microbiol Parasitol (Mex) 8, 33-7. Screening of Lactic Acid Bacteria from South African Barley Beer for Production of Bacteriocin-like Compounds. Folia Microbiol 49 (4) 406-410 http://www.biomed.cas.cz/mbu/folia/	ATCC 8041	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus pentosus*		Dairy	Psoni, L., Tzanetakis, N., Litopoulou-Tzanetaki, E. (2003). Microbial character-istics of Batzos, a traditional Greek cheese from raw goat's milk. FoodMicrobiology 20, 575–582.	ATCC 8041	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus pentosus*		Plant Based	Emerenini, C., Afolabi, O.R., Okolie, P.I., Akintokun, A.K. (2013). Isolation and Molecular Characterization of Lactic Acid Bacterial Isolated from Fresh Fruits and Vegetables Using Nested PCR Analysis. British Microbiology Research Journal 3 (3): 368-377.	ATCC 8041	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus pentosus*		Plant Based	Emerenini, C., Afolabi, O.R., Okolie, P.I., Akintokun, A.K. (2013). Isolation and Molecular Characterization of Lactic Acid Bacterial Isolated from Fresh Fruits and Vegetables Using Nested PCR Analysis. British Microbiology Research Journal 3 (3): 368-377.	ATCC 8041	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus pentosus*		Alcoholic Beverages	Poittevin de De Cores, Carrasco, A. (1966). Study on malolactic fermentation of wines in Uruguay. V. Study of the metabolism of Lactobacillus plantarum (pentosus and arabinosus) and of Lactobacillus buchneri isolated from wines and their enologic uic use.	ATCC 8041	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus plantarum*	*Lactiplantibacillus plantarum* subsp. *plantarum*	Plant Based	Leisner, J.J., Vancanneyt, M., Rusul, G., Pot, B., Lefebvre, K., Fresi, A., Tee, L.K. (2001). Identification of lactic acid bacteria constituting the predominating microflora in an acid-fermented condiment (tempoyak) popular in Malaysia. Int J Food Microbiol. 2001 Jan 22;63(1-2):149-57.	ATCC 14917	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus plantarum*	*Lactiplantibacillus plantarum* subsp. *plantarum*	Bakery	Reale, A., Mannina, L., Tremonte, P., Sobolev, A.P., Succi, M., Sorrentino, E., Coppola, R. (2004). Phytate degradation by lactic acid bacteria and yeasts during the wholemeal dough fermentation: a 31P NMR study. J Agric Food Chem. 2004 Oct 6;52(20):6300-5.	ATCC 14917	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus plantarum*	*Lactiplantibacillus plantarum* subsp. *plantarum*	Alcoholic Beverages	Bhandari, R.R., Russell, C., Walker, T.K. (1954). Study of Lactic Acid Bacteria Associated with Brewery Products. J.Sc.. Food Agri. January 5, 27-31. Todovrov, S.D., Dicks, L.M.T. (2004). Screening of Lactic Acid Bacteria from South African Barley Beer for Production of Bacteriocin-like Compounds. Folia Microbiol 49 (4) 406-410 http://www.biomed.cas.cz/mbu/folia/	ATCC 14917	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus plantarum*	*Lactiplantibacillus plantarum* subsp. *plantarum*	Dairy	Cogan, T.M. (1996). History and taxonomy of starter cultures. In Dairy Starter Cultures. TM. Cogand and JP Accolas, editors. VCH Publishers: New York. 1-23.	ATCC 14917	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus plantarum*	*Lactiplantibacillus plantarum* subsp. *plantarum*	Seafood	Orillo, C.A., Pederson, C.S. (1968). Lactic acid bacterial fermentation of burong dalag. Appl Microbiol. 16, 1669-71. Jeppesen, V. F., Huss, H.H. (1993). Characteristics and anatgonistic activity of lactic acic bacteria isolated from chille fish products. IJFM 18, 305-320 Fricourt et al. (1994). L plantarum BF001 Isolated from Processed Channel Catfish. J Food Protection 57 p698-702	ATCC 14917	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus plantarum*	*Lactiplantibacillus plantarum* subsp. *plantarum*	Meat	Hammes, W.P., Knauf, H.J. (1994). Starters in the Processing of Meat Products. Meat Science 36 155-168 Samelis, J., Maurogenakis, F. and Metaxopoulos, J. (1994). Characterisation of lactic acid bacteria isolated from naturally fermented Greek dry salami. Int. J. Food Microbiol., 23, 179-196.	ATCC 14917	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus plantarum*	*Lactiplantibacillus plantarum* subsp. *plantarum*	Plant Based	Trias, R., Baneras, L., Badosa, E., Montesinos, E. (2008). Bioprotection of Golden Delicious apples and Iceberg lettuce against foodborne bacterial pathogens by lactic acid bacteria IJFM 123 50-60	ATCC 14917	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus plantarum*	*Lactiplantibacillus plantarum* subsp. *plantarum*	Alcoholic Beverages	König, H., Unden, G., Fröhlich, J. (2009). Biology of Microorganisms on Grapes, in Must and in Wine. Springer-Verlag DOI: 10.1007/978-3-540-85463-0 Carlo, P., Cansado, J., Velfizquez, J.B., Sieiro, C., Longo, E. and Villa, T.G. (1991) Effect of diffrent physioco-chemical condition on malolactic fermentation of four lactobacillus plantarum wild strains isolated from wines of Northwestern Spain Biotechnology Letters 13 No 11 p781-787 Velázquez, J.B., Carlo, P., Longo, E., Cansado, J., Sieiro, C., Villa T.G. (1991). Effect of L-Malate, D-Glucose and L-Lactate on malolactic Fermentation and Growth of Lactobacillus plantarum and Lactobacillus curvatus Wild Strains Isolated from Wine J.of Fermentetion and Bioengineering 71 No 5, 363-366.	ATCC 14917	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactiplantibacillus*	*Lactiplantibacillus plantarum*	*Lactiplantibacillus plantarum* subsp. *plantarum*	Plant Based	Kim, T.-W. et al. (2009). Analysis of microbial communities in doenjang, a Korean fermented soypaste, using nested PCR-denaturing gradient gel electrophoresis. Int. J. Food Microbiol., 131, 265-271.	ATCC 14917	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus acetotolerans*		Bakery	Vera, A., Ly-Chatain, M.H., Rigobello, V., Demarigny, Y. (2012). Description of a French natural wheat sourdough over 10 consecutive days focussing on the lactobacilli present in the microbiota. Antonie Van Leeuwenhoek. 2012 Feb;101(2):369-77.	ATCC 43578	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus acetotolerans*		Plant Based	Arici, M., Coskun, F. (2001). Hardaliye: Fermented grape juice as a traditional Turkish beverage. Food Microbiology 18, 417–421.	ATCC 43578	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus acetotolerans*		Vinegar	Entani, E., Masai, H., Suzuki, K-I. (1986). Lactobacillus acetotolerans, a new species from fermented vinegar broth. Int J Syst Bacteriol 1986;36:544–549.	ATCC 43578	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus acidophilus*		Dairy	Weiss, N., Busse, M., Kandler, O. (1968). The origin of fermentation by-products in the lactic acid fermentation of Lactobacillus acidophilus. Arch Mikrobiol. 62, 85-93. Baroudi, A.A., Collins, E.B. (1976). Microorganisms and characteristics of laban. J Dairy Sci. 59, 200-2.	ATCC 700396	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus acidophilus*		Plant Based	Buruleanu, C., Nicolescu, C., Avram, D., Manea, I., Bratu, M. (2012). Effects of yeast extract and different amino acids on the dynamics of some components in cabbage juice during fermentation with Bifidobacterium lactis BB-12. Food Science & Biotechnology, 21, 691-699	ATCC 700396	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus acidophilus*		Alcoholic Beverages	Sohrabvandi, S., Mousavi, S.M., Razavi, S.H., Shaheed Behesti. (2010). Viability of probiotic bacteria in low alcohol and non-alcoholic beer during refrigerated storage. Philipp Agr Scient 93(1):104-109.	ATCC 700396	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus acidophilus*		Plant Based	Salovaara, H. (1996). The time of cereal based functional foods is here: introducing Yosa®, a vellie. In Skrede, G. and Magnus, E.M. (Eds), 26th Nordic Cereal Congress, 195-202.	ATCC 700396	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus acidophilus*		Plant Based	Akinola, O.J. et al. (2015). Chemical characterisation and microbiological quality of naturally fermenting soy milk	ATCC 700396	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus amylolyticus*		Plant Based	Fei, Y., Li, L., Chen, L., Zheng, Y., Yu, B. (2018). High-throughput sequencing and culture-based approaches to analyze microbial diversity associated with chemical changes in naturally fermented tofu whey, a traditional Chinese tofu-coagulant. Food Microbiol. 2018 Dec;76:69-77.	DSM 11664	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus amylolyticus*		Plant Based	Liu, Z., Li, J., Wei, B., Huang, T., Xiao, Y., Peng, Z., Xie, M., Xiong, T. (2019). Bacterial community and composition in Jiang-shui and Suan-cai revealed by high-throughput sequencing of 16S rRNA. Int J Food Microbiol. 2019 Oct 2;306:108271	DSM 11664	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus amylolyticus*		Dairy	Yang, J., Yu, P., Liu, X., Zhao, J., Zhang, H., Chen, W. (2021). Shifts in diversity and function of bacterial community during manufacture of Rushan. J Dairy Sci. 2021 Sep 2:S0022-0302(21)00862-6.	DSM 11664	Zheng et al., A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus amylolyticus*		Bakery	Pedersen, C. (2004). Microbiological characterization of wet wheat distillers' grain, with focus on isolation of lactobacilli with potential as probiotics. Appl Environ Microbiol. 70, 1522-7.	DSM 11664	Zheng et al., A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus amylolyticus*		Alcoholic Beverages	Bohak, I., Back, W., Richter, L., Ehrmann, M., Ludwig, W., Schleifer, K.H. (1998). Lactobacillus amylolyticus sp. nov., isolated from beer malt and beer wort. Syst Appl Microbiol. 1998 Aug;21(3):360-4. doi: 10.1016/S0723-2020(98)80045-3. PMID: 9779604.	DSM 11664	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus amylovorus*		Alcoholic Beverages	Bohak, I., Back, W., Richter, L., Ehrmann, M., Ludwig, W., Schleifer, K.H. (1998). Lactobacillus amylolyticus sp. nov., isolated from beer malt and beer wort. Syst Appl Microbiol. 1998 Aug;21(3):360-4.	ATCC 33620	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus amylovorus*		Bakery	Fitzsimons, A. (1994). Development of an amylolytic Lactobacillus plantarum silage strain expressing the Lactobacillus amylovorus alpha-amylase gene. Appl Environ Microbiol. 60, 3529-35.	ATCC 33620	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus crispatus*		Plant Based	Tomita, S., Watanabe, J., Nakamura, T., Endo, A., Okada, S. (2020). Characterisation of the bacterial community structures of sunki, a traditional unsalted pickle of fermented turnip leaves. J Biosci Bioeng. 2020 May;129(5):541-551. doi: 10.1016/j.jbiosc.2019.11.010.	ATCC 33820	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus crispatus*		Dairy	Henri-Dubernet, S., Desmasures, N., Guéguen, M. (2008). Diversity and dynamics of lactobacilli populations during ripening of RDO Camembert cheese. Can J Microbiol. 2008 Mar;54(3):218-28.	ATCC 33820	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus crispatus*		Bakery	Ehrmann, M.A., Vogel, R.F. (2005). Molecular taxonomy and genetics of sourdough lactic acid bacteria Trends in Food Science & Technology 16, 31-42.	ATCC 33820	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus delbrueckii*	*Lactobacillus delbrueckii* subsp. *bulgaricus*	Alcoholic Beverages	Pilone, G.J., Kunkee, R.E., Webb, A.D. (1966). Chemical characterization of wines fermented with various malo-lactic bacteria. Appl Microbiol. 1966 Jul;14(4):608-15.	ATCC 11842	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus delbrueckii*	*Lactobacillus delbrueckii* subsp. *bulgaricus*	Meat	Oliveira, R.B., de L Oliveira, A., Glória, M.B. (2008). Screening of lactic acid bacteria from vacuum packaged beef for antimicrobial activity. Braz J Microbiol. 2008 Apr;39(2):368-74.	ATCC 11842	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus delbrueckii*	*Lactobacillus delbrueckii* subsp. *bulgaricus*	Dairy	Shahani, K.M., Chandan, R.C. (1979). Nutritional and healthful aspects of cultured and culture-containing dairy foods. J Dairy Sci. 62, 1685-94.	ATCC 11842	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus delbrueckii*	*Lactobacillus delbrueckii* subsp. *bulgaricus*	Plant Based	Sengun, I.Y. et al. (2009). Identification of lactic acid bacteria isolated from Tarhana, a traditional Turkish fermented food. Int J. Food Microbiol., 135, 105-111.	ATCC 11842	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus delbrueckii*	*Lactobacillus delbrueckii* subsp. *delbrueckii*	Dairy	Ludszuweit, M., Schmacht, M., Keil, C., Haase, H., Senz, M. (2020). Impact of Media Heat Treatment on Cell Morphology and Stability of L. acidophilus, L. johnsonii and L. delbrueckii subsp. delbrueckii during Fermentation and Processing Fermention 6(4):94	ATCC 9649	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus delbrueckii*	*Lactobacillus delbrueckii* subsp. *delbrueckii*	Plant Based	Etchells, J.L. (1964). Pure Culture Fermentation of Brined Cucumbers. Appl Microbiol. 12, 523-35.	ATCC 9649	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus delbrueckii*	*Lactobacillus delbrueckii* subsp. *delbrueckii*	Alcoholic Beverages	Pilone, G.J., Kunkee, R.E. and Webb, A.D. (1966). Chemical Characterization of Wines Fermented with Various Malo-lactic Bacteria, Applied Microbiology 14 No. 4, p. 608-615	ATCC 9649	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus delbrueckii*	*Lactobacillus delbrueckii* subsp. *lactis*	Dairy	Lazos, E.S. (1993). The fermentation of trahanas: a milk-wheat flour combination. Plant Foods Hum Nutr. 44, 45-62.	ATCC 12315	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus gasseri*		Plant Based	Ewe, J.A., Wan Abdullah, W.N., Bhat, R., Karim, A.A., Liong, M.T. (2012). Enhanced growth of lactobacilli and bioconversion of isoflavones in biotin-supplemented soymilk upon ultrasound-treatment. Ultrason Sonochem. 2012 Jan;19(1):160-73.	ATCC 33323	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus gasseri*		Bakery	Ehrmann, M.A., Vogel, R.F. (2005). Molecular taxonomy and genetics of sourdough lactic acid bacteria. Trends in Food Science & Technology 16, 31-42.	ATCC 33323	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus helveticus*		Plant Based	Champagne, C.P., Tompkins, T.A., Buckley, N.D., Green-Johnson, J.M. (2010). Effect of fermentation by pure and mixed cultures of Streptococcus thermophilus and Lactobacillus helveticus on isoflavone and B-vitamin content of a fermented soy beverage. Food Microbiol. 2010 Oct;27(7):968-72.	ATCC 15009	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus helveticus*		Dairy	Frazier, W.C., Johnson jr, W.T., Evans, F.R., Ramsdell, G.A. (1935). The Bacteriology of Swiss Cheese III. The Relation of Acidity of Starters and of pH of the Interior of Swiss Cheese to Quality of Chesses. Journal Dairy Science 18: 373--388.	ATCC 15009	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus helveticus*		Bakery	Faid, M. et al. (1994). Characterization of sourdough bread ferments made in the laboratory by traditional methods. Z. Lebensm. Unters. Forsch., 198, 287-291. Vogelmann, S.A. et al. (2009). Adatability of lactic acid bacteria and yeasts to sourdoughs prepared from cereals, pseudocereals and cassava and use of competitive strains as starters. Int. J. Food Microbiol., 130, 205-212.	ATCC 15009	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus helveticus*		Plant Based	Schafner, D.W., Beuchat, L.R. (1986). Fermentation of aqueous plant seed extracts by lactic Acid bacteria. Appl Environ Microbiol. 51, 1072-6.	ATCC 15009	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus jensenii*		Dairy	Virtanen, T. (2007). Development of antioxidant activity in milk whey during fermentation with lactic acid bacteria. J Appl Microbiol. 102, 106-15.	ATCC 25258	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus johnsonii*		Dairy	Reuter, G. (1997). Present and future of probiotics in Germany and in Central Europe. Biosci. Microflora, 16, 43-51.	ATCC 49335	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus johnsonii*		Bakery	Ehrmann, M.A., Vogel, R.F. (2005). Molecular taxonomy and genetics of sourdough lactic acid bacteria Trends in Food Science & Technology 16, 31-42.	ATCC 49335	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus kefranofaciens*	*Lactobacillus kefranofaciens* subsp. *kefiranofaciens*	Dairy	Fujisawa, T., Adachi, S., Toba, T., Arihara, K., Mitsuoka, T. (1988). Lactobacillus kefiranofaciens sp. nov. Isolated from kefir grains. Int. J. Syst. Bacteriol. 38, 12–14.	ATCC 43761	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lactobacillus*	*Lactobacillus kefranofaciens*	*Lactobacillus kefranofaciens* subsp. *kefirgranum*	Dairy	Takizawa, S., Kojima, S., Tamura, S., Fujinaga, S., Benno, Y., Nakase, T. (1994). Lactobacillus kefirgranum sp. nov. And Lactobacillus parakefir sp. nov., two new species from kefir grains. Int J Syst Bacteriol 44, 435–439.	ATCC 51647	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lapidilactobacillus*	*Lapidilactobacillus dextrinicus*		Meat	Deibel, R.H. (1961). Microbiology of meat curing. IV. A lyophilized Pediococcus cerevisiae starter culture for fermented sausage. Appl Microbiol. 9, 239-43.	ATCC 33087	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Latilactobacillus*	*Latilactobacillus curvatus*		Dairy	Briggiler-Marcó, M., Capra, M.L., Quiberoni, A., Vinderola, G., Reinheimer, J.A., Hynes, E. (2007). Nonstarter Lactobacillus strains as adjunct cultures for cheese making: in vitro characterization and performance in two model cheeses. J Dairy Sci. 2007 Oct;90(10):4532-42.	ATCC 25601	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Latilactobacillus*	*Latilactobacillus curvatus*		Bakery	Pepe, O., Ventorino, V., Cavella, S., Fagnano, M., Brugno, R. (2013). Prebiotic content of bread prepared with flour from immature wheat grain and selected dextran-producing lactic acid bacteria. Appl Environ Microbiol. 2013 Jun;79(12):3779-85.	ATCC 25601	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Latilactobacillus*	*Latilactobacillus curvatus*		Plant Based	Yoon, M.Y., Hwang, H.J. (2008). Reduction of soybean oligosaccharides and properties of alpha-D-galactosidase from Lactobacillus curvatus R08 and Leuconostoc mesenteroides [corrected] JK55. Food Microbiol. 2008 Sep;25(6):815-23.	ATCC 25601	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Latilactobacillus*	*Latilactobacillus curvatus*		Meat	Samelis, J., Maurogenakis, F. and Metaxopoulos, J. (1994). Characterisation of lactic acid bacteria isolated from naturally fermented Greek dry salami. Int. J. Food Microbiol., 23, 179-196.	ATCC 25601	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Latilactobacillus*	*Latilactobacillus curvatus*		Seafood	Tomé, E., Gibbs, P.A., Teixeira, P.C. (2008). Growth control of Listeria innocua 2030c on vacum-packaged cold-smoked salmon by lactic acid bacteria. IJFM 121, 285-294. Andrighetto, C., Lombardi, A., Ferrati, M., Guidi, A., Corrain, C., Arcangeli, G. (2009). Lactic acid bacteria biodiversity in Italian marinated seafood salad and their interactions on the growth of Listeria monocytogenes. Food Control 20 p462–468 Leroi, F., Cornet, J., Chevalier, F., Cardinal, M., Coeuret, G., Chaillou, S., Joffraud., J.J. (2015). Selection of bioprotective cultures for preventing cold-smoked salmon spoilage. IJFM 213, 79-87.	ATCC 25601	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Latilactobacillus*	*Latilactobacillus curvatus*		Plant Based	Wouters et al. (2013). Species diversity, community dynamics, and metabolite kinetics of spontaneous leek fermentations. Food Microbiology 33 p185-196	ATCC 25601	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Latilactobacillus*	*Latilactobacillus sakei*	*Latilactobacillus sakei* subsp. *sakei*	Dairy	Yu, J., Wang, H.M., Zha, M.S., Qing, Y.T., Bai, N., Ren, Y., Xi, X.X., Liu, W.J., Menghe, B.L., Zhang, H.P. (2015). Molecular identification and quantification of lactic acid bacteria in traditional fermented dairy foods of Russia. J Dairy Sci. 2015 Aug;98(8):5143-54.	ATCC 15521	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Latilactobacillus*	*Latilactobacillus sakei*	*Latilactobacillus sakei* subsp. *sakei*	Bakery	Minervini, F., Lattanzi, A., De Angelis, M., Di Cagno, R., Gobbetti, M. (2012). Influence of artisan bakery- or laboratory-propagated sourdoughs on the diversity of lactic acid bacterium and yeast microbiotas. Appl Environ Microbiol. 2012 Aug;78(15):5328-40.	ATCC 15521	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Latilactobacillus*	*Latilactobacillus sakei*	*Latilactobacillus sakei* subsp. *sakei*	Alcoholic Beverages	Katagiri, H., Kitahara, K., Fukami, K. (1934). The characteristics of the lactic acid bacteria isolated from moto, yeast mashes for sake manufacture. IV. Classification of the lactic acid bacteria. Bulletin of the Agricultural Chemical Society of Japan 10, 156-157.]	ATCC 15521	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Latilactobacillus*	*Latilactobacillus sakei*	*Latilactobacillus sakei* subsp. *sakei*	Seafood	Zhang, J., Wang, X., Huo, D., Li, W., Hu, Q., Xu, C., Liu, S., Li, C. (2016). Metagenomic approach reveals microbial diversity and predictive microbial metabolic pathways in Yucha, a traditional Li fermented food. Sci Rep. 2016 Aug 31;6:32524. doi: 10.1038/srep32524. PMID: 27578483; PMCID: PMC5006176. Dai, Z., Li, Y., Wu, J., Zhao, Q. (2013). Diversity of lactic acid bacteria during fermentation of a traditional Chinese fish product, Chouguiyu (stinky mandarinfish). J Food Sci. 2013 Nov;78(11):M1778-83. doi: 10.1111/1750-3841.12289. PMID: 24245896.	ATCC 15521	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Latilactobacillus*	*Latilactobacillus sakei*	*Latilactobacillus sakei* subsp. *sakei*	Plant Based	Jung, J.Y. et al. (2013). Metatranscriptomic analysis of lactic acid bacterial gene expression during kimchi fermentation. Int. J. Food Microbiol., 163, 171-179. Cho, K.M. and Seo, W.T. (2007). Bacterial diversity in Korean traditional fermented foods (Doenjang and Ganjang) by 16S rRNA gene sequence analysis. Food Sci. Biotechnol., 16, 320-324.	ATCC 15521	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Latilactobacillus*	*Latilactobacillus sakei*	*Latilactobacillus sakei* subsp. *carnosus*	Meat	Bover-Cid, S. (2000). Mixed starter cultures to control biogenic amine production in dry fermented sausages. J Food Prot. 63, 1556-62. Hammes W.P. & Knauf H.J. 1994 Starters in the Processing of Meat Products. Meat Science 36 p 155-168	DSM 15831	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lentilactobacillus*	*Lentilactobacillus buchneri*		Plant Based	Zhao, N., Zhang, C., Yang, Q., Guo, Z., Yang, B., Lu, W., Li, D., Tian, F., Liu, X., Zhang, H., Chen, W. (2016). Selection of Taste Markers Related to Lactic Acid Bacteria Microflora Metabolism for Chinese Traditional Paocai: A Gas Chromatography-Mass Spectrometry-Based Metabolomics Approach. J Agric Food Chem. 2016 Mar 23;64(11):2415-22.	ATCC 11577	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lentilactobacillus*	*Lentilactobacillus buchneri*		Alcoholic Beverages	Poittevin de De Cores. (1966). Study on malolactic fermentation of wines in Uruguay. V. Study of the metabolism of Lactobacillus plantarum (pentosus and arabinosus) and of Lactobacillus buchneri isolated from wines and their enologic uic use] [Article in Spanish] Rev Latinoam Microbiol Parasitol (Mex) 8, 33-7.	ATCC 11577	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lentilactobacillus*	*Lentilactobacillus buchneri*		Bakery	Spicher, G., Schröder, R. (1978). Die Mikroflora des Sauerteiges IV. Mitteilung: Untersuchungen fiber die Art der in ,,Reinzuchtsauern anzutreffenden stäbchenförmigen Milchsäurebakterien (Genus Lactobacillus Beijerinck). Z. Lebensm. Unters. Forsch. 167, 342 354	ATCC 11577	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lentilactobacillus*	*Lentilactobacillus diolivorans*		Bakery	Zhang, C., Brandt, M.J., Schwab, C., Gänzle, M.G. (2010). Propionic acid production by cofermentation of Lactobacillus buchneri and Lactobacillus diolivorans in sourdough. Food Microbiol. 2010 May;27(3):390-5.	DSM 14421T	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lentilactobacillus*	*Lentilactobacillus diolivorans*		Plant Based	Ibarburu, I., Aznar, R., Elizaquível, P., García-Quintáns, N., López, P., Munduate, A., Irastorza, A., Dueñas, M.T. (2010). A real-time PCR assay for detection and quantification of 2-branched (1,3)-beta-D-glucan producing lactic acid bacteria in cider. Int J Food Microbiol. 2010 Sep 30;143(1-2):26-31.	DSM 14421T	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004108
Monera	*Firmicutes*	*Lactobacillaceae*	*Lentilactobacillus*	*Lentilactobacillus diolivorans*		Dairy	Yu, J., Wang, W.H., Menghe, B.L., Jiri, M.T., Wang, H.M., Liu, W.J., Bao, Q.H., Lu, Q., Zhang, J.C., Wang, F., Xu, H.Y., Sun, T.S., Zhang, H.P. (2011). Diversity of lactic acid bacteria associated with traditional fermented dairy products in Mongolia. J Dairy Sci. 2011 Jul;94(7):3229-41.	DSM 14421T	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004109
Monera	*Firmicutes*	*Lactobacillaceae*	*Lentilactobacillus*	*Lentilactobacillus diolivorans*		Plant Based	Krooneman, J., Faber, F., Alderkamp, A.C., Oude Elferink, S.J.H.W., Driehuis, F., Cleenwerck, I., Swings, J., Gottschal, J.C., Vancanneyt, M. (2002). Lactobacillus diolivorans sp. nov., a 1,2-propanediol-degrading bacterium isolated from aerobically stable maize silage. Int. J. Syst. Evol. Microbiol. 52, 639-646.	DSM 14421	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Lentilactobacillus*	*Lentilactobacillus farraginis*		Alcoholic Beverages	Escalente-Minakata, P., Blaschek, H.P., Barba se la Rosa, A.P., Santos De Leon-Rodriguez, A. (2008). Lett Appl Microbiol. Jun;46(6):626-30. Identification of yeast and bacteria involved in the mezcal fermentation of Agave salmiana.	DSM 18382	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lentilactobacillus*	*Lentilactobacillus hilgardii*		Plant Based	Waldherr, F.W., Doll, V.M., Meissner, D., Vogel, R.F. (2010). Identification and characterization of a glucan-producing enzyme from Lactobacillus hilgardii TMW 1.828 involved in granule formation of water kefir. Food Microbiol. 2010 Aug;27(5):672-8.	ATCC 8290	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lentilactobacillus*	*Lentilactobacillus hilgardii*		Alcoholic Beverages	Douglas, H.C., Cruess, W.V. (1936). Lactobacillus from california wine: Lactobacillus hilgardii. Food Res. 1, 113–119.	ATCC 8290	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lentilactobacillus*	*Lentilactobacillus kefiri*		Dairy	Kandler, O., Kunath, P. (1983b). Lactobacillus kefir sp. nov., a component of the microflora of kefir. Syst. Appl. Microbiol. 4, 286–294.	ATCC 35411	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lentilactobacillus*	*Lentilactobacillus kisonensis*		Plant Based	Watanabe, K., Fujimoto, J., Tomii, Y., Sasamoto, M., Makino, H., Kudo., Y., Okada, S. (2009). Lactobacillus kisonensis sp. nov., Lactobacillus otakiensis sp. nov., Lactobacillus rapi sp. nov. and Lactobacillus sunkii sp. nov., heterofermentative species isolated from sunki, a traditional Japanese pickle. Int. J. Syst. Evol. Microbiol. 59, 754-760.	DSM 19906	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lentilactobacillus*	*Lentilactobacillus otakiensis*		Plant Based	Watanabe, K., Fujimoto, J., Tomii, Y., Sasamoto, M., Makino, H., Kudo., Y., Okada, S. (2009). Lactobacillus kisonensis sp. nov., Lactobacillus otakiensis sp. nov., Lactobacillus rapi sp. nov. and Lactobacillus sunkii sp. nov., heterofermentative species isolated from sunki, a traditional Japanese pickle. Int. J. Syst. Evol. Microbiol. 59, 754-760.	DSM 19908	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lentilactobacillus*	*Lentilactobacillus parabuchneri*		Dairy	Henri-Dubernet, S., Desmasures, N., Guéguen, M. (2008). Diversity and dynamics of lactobacilli populations during ripening of RDO Camembert cheese. Can J Microbiol. 2008 Mar;54(3):218-28.	NCIMB 8838	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lentilactobacillus*	*Lentilactobacillus parabuchneri*		Bakery	Farrow, J.A.E., Phillips, B.A., Collins, M.D. (1988). Nucleic acid studies on some heterofermentative lactobacilli: description of Lactobacillus malefermentans sp. nov. and Lactobacillus parabuchneri sp. nov. FEMS Microbiol. Lett. 55, 163-168.	NCIMB 8838	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Lentilactobacillus*	*Lentilactobacillus parafarraginis*		Dairy	Zanirati, D.F., Abatemarco, M.Jr., Sandes, S.H. de C., Nicoli, J.R., Nunes, A.C., Neumann, E. (2015). Selection of lactic acid bacteria from Brazilian kefir grains for potential use as starter or probiotic cultures. Anaerobe 32, 70-76.	DSM 18390	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lentilactobacillus*	*Lentilactobacillus parafarraginis*		Plant Based	Wu, J., Du, R., Gao, M., Sui, Y., Xiu, L. and Wang, X. (2014). Naturally Occurring Lactic Acid Bacteria Isolated from Tomato Pomace Silage, Asian Australas. J. Anim. Sci. 27, 648-657. Montaño, A., Sánchez, A.H., Casado, F.J., Beato, V.M., Castro, A. (2013). Degradation of ascorbic acid and potassium sorbate by different Lactobacillus species isolated from packed green olives. Food Microbiology 34, 7-11.	DSM 18390	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lentilactobacillus*	*Lentilactobacillus parakefiri*		Dairy	Takizawa, S., Kojima, S., Tamura, S., Fujinaga, S., Benno, Y., Nakase, T. (1994). Lactobacillus kefirgranum sp. nov. and Lactobacillus parakefir sp. nov., two new species from kefir grains. Int. J. Syst. Bacteriol. 44, 435–439.	ATCC 51648	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lentilactobacillus*	*Lentilactobacillus rapi*		Plant Based	Watanabe, K., Fujimoto, J., Tomii, Y., Sasamoto, M., Makino, H., Kudo., Y., Okada, S. (2009). Lactobacillus kisonensis sp. nov., Lactobacillus otakiensis sp. nov., Lactobacillus rapi sp. nov. and Lactobacillus sunkii sp. nov., heterofermentative species isolated from sunki, a traditional Japanese pickle. Int. J. Syst. Evol. Microbiol. 59, 754-760.	DSM 19907	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Lentilactobacillus*	*Lentilactobacillus sunkii*		Plant Based	Watanabe, K., Fujimoto, J., Tomii, Y., Sasamoto, M., Makino, H., Kudo., Y., Okada, S. (2009). Lactobacillus kisonensis sp. nov., Lactobacillus otakiensis sp. nov., Lactobacillus rapi sp. nov. and Lactobacillus sunkii sp. nov., heterofermentative species isolated from sunki, a traditional Japanese pickle. Int. J. Syst. Evol. Microbiol. 59, 754-760.	DSM 19904	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc carnosum*		Meat	Amaretti, A., Schlundt, J. et al. (2020). Draft genome sequences of 12 Leuconostoc carnosum strains isolated from cooked ham packaged in a modified atmosphere and from fresh sausages. Microbiol Resour Announc. 9, e1247–e1219. doi: 10.1128/MRA.01247-19	ATCC 49367	Shaw, B.G., Harding, C.D. (1989). Leuconostoc gelidum sp. nov and sp. nov. Leuconostoc gelidum from chillstored meats. Int. J. Syst. Bacteriol. 39, 217–223.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc carnosum*		Seafood	Jeppesen, V.F. and Huss, H.H. (1994). Characteristics and antagonistic activity of LAB isolated from chilled fish products IJFM 18 p305-320	ATCC 49367	Shaw, B.G., Harding, C.D. (1989). Leuconostoc gelidum sp. nov and sp. nov. Leuconostoc gelidum from chillstored meats. Int. J. Syst. Bacteriol. 39, 217–223.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc carnosum*		Plant Based	Jung, J.Y. et al. (2013). Metatranscriptomic analysis of lactic acid bacterial gene expression during kimchi fermentation. Int. J. Food Microbiol., 163, 171-179. Yamaner, C.I., Sezen, I.Y. and Tanriseven, A. (2010). Selection of psychrotrophic Leuconostoc spp. from native fruits, and studies on their dextransucrases. Food Sci. Biotechnol., 19, 175-184.	ATCC 49367	Shaw, B.G., Harding, C.D. (1989). Leuconostoc gelidum sp. nov and sp. nov. Leuconostoc gelidum from chillstored meats. Int. J. Syst. Bacteriol. 39, 217–223.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc carnosum*		Plant Based	Gu, J. et al. (2018). Biogenic amines content and assessment of bacterial and fungal diversity in stinky tofu - A traditional fermented soy curd. LWT, 88, 26-34.	ATCC 49367	Shaw, B.G., Harding, C.D. (1989). Leuconostoc gelidum sp. nov and sp. nov. Leuconostoc gelidum from chillstored meats. Int. J. Syst. Bacteriol. 39, 217–223.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc citreum*		Dairy	Kim, M.J., Lee, H.W., Lee, M.E., Roh, S.W., Kim, T.W. (2019). Mixed starter of Lactococcus lactis and Leuconostoc citreum for extending kimchi shelf-life. J Microbiol. 2019 Jun;57(6):479-484. doi: 10.1007/s12275-019-9048-0. Epub 2019 May 27. PMID: 31073899	ATCC 13146	Farrow, J.A.E., Facklam, R.R., Collins, M.D. (1989). Nucleic acid homologies of some vancomycin-resistant leuconostocs and description of Leuconostoc citreum sp. nov. and Leuconostoc pseudomesenteroides sp. nov. Int. J. Syst. Bacteriol. 39, 279-283.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc citreum*		Seafood	Paludan-Müller, C. (1999). Characterization of lactic acid bacteria isolated from a Thai low-salt fermented fish product and the role of garlic as substrate for fermentation. Int J Food Microbiol. 46, 219-29.	ATCC 13146	Farrow, J.A.E., Facklam, R.R., Collins, M.D. (1989). Nucleic acid homologies of some vancomycin-resistant leuconostocs and description of Leuconostoc citreum sp. nov. and Leuconostoc pseudomesenteroides sp. nov. Int. J. Syst. Bacteriol. 39, 279-283.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc citreum*		Bakery	Milanović, V., Osimani, A., Garofalo, C., Belleggia, L., Maoloni, A., Cardinali, F., Mozzon, M., Foligni, R., Aquilanti, L., Clementi, F. (2020). Selection of cereal-sourced lactic acid bacteria as candidate starters for the baking industry. PLoS One. 2020 Jul 23;15(7):e0236190. doi: 10.1371/journal.pone.0236190. PMID: 32702068; PMCID: PMC7377444	ATCC 13146	Farrow, J.A.E., Facklam, R.R., Collins, M.D. (1989). Nucleic acid homologies of some vancomycin-resistant leuconostocs and description of Leuconostoc citreum sp. nov. and Leuconostoc pseudomesenteroides sp. nov. Int. J. Syst. Bacteriol. 39, 279-283.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc citreum*		Plant Based	Choi, I.K., Jung, S.H., Kim, B.J., Park, S.Y., Kim, J., Han, H.U. (2003). Novel Leuconostoc citreum starter culture system for the fermentation of kimchi, a fermented cabbage product. Antonie Van Leeuwenhoek. 2003;84(4):247-53. doi: 10.1023/a:1026050410724. PMID: 14574101.	ATCC 13146	Farrow, J.A.E., Facklam, R.R., Collins, M.D. (1989). Nucleic acid homologies of some vancomycin-resistant leuconostocs and description of Leuconostoc citreum sp. nov. and Leuconostoc pseudomesenteroides sp. nov. Int. J. Syst. Bacteriol. 39, 279-283.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc citreum*		Plant Based	Fang Feng, Qingqing Zhou, Yanfang Yang, Fangkun Zhao, Renpeng Du, Ye Han, Huazhi Xiao, Zhijiang Zhou. (2018). Characterization of highly branched dextran produced by Leuconostoc citreum B-2 from pineapple fermented product. International Journal of Biological Macromolecules, Volume 113, 2018, Pages 45-50,	ATCC 13146	Farrow, J.A.E., Facklam, R.R., Collins, M.D. (1989). Nucleic acid homologies of some vancomycin-resistant leuconostocs and description of Leuconostoc citreum sp. nov. and Leuconostoc pseudomesenteroides sp. nov. Int. J. Syst. Bacteriol. 39, 279-283.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc citreum*		Alcoholic Beverages	Escalante, A., Giles-Gómez, M., Esquivel Flores, G., Matus Acuña, V., Moreno-Terrazas, R., López-Munguía, A., Lappe-Oliveras, P. (2012). Pulque Fermentation. In Handb. Plant-Based Fermented Food Beverage Technol., Second Edition. Edited by: Hui YH. CRC Press, Boca Raton, FL; 2012:691-706.	ATCC 13146	Farrow, J.A.E., Facklam, R.R., Collins, M.D. (1989). Nucleic acid homologies of some vancomycin-resistant leuconostocs and description of Leuconostoc citreum sp. nov. and Leuconostoc pseudomesenteroides sp. nov. Int. J. Syst. Bacteriol. 39, 279-283.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc fallax*		Plant Based	Barrangou, R. (2002). Identification and characterization of Leuconostoc fallax strains isolated from an industrial sauerkraut fermentation. Appl Environ Microbiol. 68, 2877-84.	ATCC 700006	Martinez-Murcia, A.J., Collins, M.D. (1991). A phylogenetic analysis of an atypical leuconostoc: description of Leuconostoc fallax sp. nov. FEMS Microbiol. Lett. 82, 55-60. VL 40.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc holzapfelii*		Plant Based	De Bruyne, K., Schillinger, U., Caroline, L., Boehringer, B., Cleenwerck, I., Vancanneyt, M., De Vuys, L., Franz, C.M.A.P., Vandamme, P. (2007). Leuconostoc holzapfelii sp. nov., isolated from Ethiopian coffee fermentation and assessment of sequence analysis of housekeeping genes for delineation of Leuconostoc species. Int. J. Syst. Evol. Microbiol. 57, 2952-2959.	DSM 20189	De Bruyne, K., Schillinger, U., Caroline, L., Boehringer, B., Cleenwerck, I., Vancanneyt, M., De Vuys, L., Franz, C.M.A.P., Vandamme, P. (2007). Leuconostoc holzapfelii sp. nov., isolated from Ethiopian coffee fermentation and assessment of sequence analysis of housekeeping genes for delineation of Leuconostoc species. Int. J. Syst. Evol. Microbiol. 57, 2952-2959.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc holzapfelii*		Plant Based	Jeong, S.H., Lee, S.H., Jung, J.Y., Choi, E.J., Jeon, C.O. (2013). Microbial succession and metabolite changes during long-term storage of Kimchi. J Food Sci. 2013 May;78(5):M763-9. doi: 10.1111/1750-3841.12095. Epub 2013 Apr 3. PMID: 23550842	DSM 20189	De Bruyne, K., Schillinger, U., Caroline, L., Boehringer, B., Cleenwerck, I., Vancanneyt, M., De Vuys, L., Franz, C.M.A.P., Vandamme, P. (2007). Leuconostoc holzapfelii sp. nov., isolated from Ethiopian coffee fermentation and assessment of sequence analysis of housekeeping genes for delineation of Leuconostoc species. Int. J. Syst. Evol. Microbiol. 57, 2952-2959.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc holzapfelii*		Bakery	Alice V. Moroni, Elke K. Arendt, Fabio Dal Bello. (2011). Biodiversity of lactic acid bacteria and yeasts in spontaneously-fermented buckwheat and teff sourdoughs. Food Microbiology,Volume 28, Issue 3, 2011	DSM 20189	De Bruyne, K., Schillinger, U., Caroline, L., Boehringer, B., Cleenwerck, I., Vancanneyt, M., De Vuys, L., Franz, C.M.A.P., Vandamme, P. (2007). Leuconostoc holzapfelii sp. nov., isolated from Ethiopian coffee fermentation and assessment of sequence analysis of housekeeping genes for delineation of Leuconostoc species. Int. J. Syst. Evol. Microbiol. 57, 2952-2959.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc inhae*		Plant Based	Kim, B., Lee, J., Jang, J., Kim, J., Han, H. (2003). Leuconostoc inhae sp. nov., a lactic acid bacterium isolated from kimchi. Int. J. Syst. Evol. Microbiol. 53, 1123-1126.	DSM 15101	Kim, B., Lee, J., Jang, J., Kim, J., Han, H. (2003). Leuconostoc inhae sp. nov., a lactic acid bacterium isolated from kimchi. Int. J. Syst. Evol. Microbiol. 53, 1123-1126.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc kimchii*		Plant Based	Jung, J.Y., Jeong, J.W., Lee, S.Y., Jin, H.M., Choi, H.W., Ryu, B.G., Han, S.S., Kang, H.K., Chung, E.J., Choi, K.M. (2019). Complete Genome Sequence of Leuconostoc kimchii Strain NKJ218, Isolated from Homemade Kimchi. Microbiol Resour Announc. 2019 Jul 3;8(27):e00367-19. doi: 10.1128/MRA.00367-19. PMID: 31270190; PMCID: PMC6606904	IMSNU 11154	Kim, J., Chun, J., Han, H.U. (2000). Leuconostoc kimchii sp. nov., a new species from kimchi. Int. J. Syst. Evol. Microbiol. 50, 1915-1919.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc kimchii*		Alcoholic Beverages	Torres-Rodríguez, I., Rodríguez-Alegría, M.E., Miranda-Molina, A. et al. (2014). Screening and characterization of extracellular polysaccharides produced by Leuconostoc kimchii isolated from traditional fermented pulque beverage. SpringerPlus 3, 583.	IMSNU 11154	Kim, J., Chun, J., Han, H.U. (2000). Leuconostoc kimchii sp. nov., a new species from kimchi. Int. J. Syst. Evol. Microbiol. 50, 1915-1919.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc lactis*		Dairy	Baroudi, A.A. (1976). Microorganisms and characteristics of laban. J Dairy Sci. 59, 200-2	ATCC 19256	Garvie, E.I. (1960). The genus Leuconostoc and its nomenclature. J. Dairy Res. 27, 283–292.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc lactis*		Alcoholic Beverages	Bora, S.S., Keot, J., Das, S., Sarma, K., Barooah, M. (2016). Metagenomics analysis of microbial communities associated with a traditional rice wine starter culture (Xaj-pitha) of Assam, India. 3 Biotech. 2016 Dec;6(2):153. doi: 10.1007/s13205-016-0471-1. Epub 2016 Jul 15. PMID: 28330225; PMCID: PMC4947050. Elizaquível, P., Pérez-Cataluña, A., Yépez, A., Aristimuño, C., Jiménez, E., Cocconcelli, P.S., Vignolo, G., Aznar, R. (2015). Pyrosequencing vs. culture-dependent approaches to analyze lactic acid bacteria associated to chicha, a traditional maize-based fermented beverage from Northwestern Argentina. Int J Food Microbiol. 2015 Apr 2;198:9-18. doi: 10.1016/j.ijfoodmicro.2014.12.027. Epub 2014 Dec 27. PMID: 25584777.	ATCC 19256	Garvie, E.I. (1960). The genus Leuconostoc and its nomenclature. J. Dairy Res. 27, 283–292.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc lactis*		Plant Based	Moon, J.S., Choi, H.S., Shin, S.Y., Noh, S.J., Jeon, C.O., Han, N.S. (2015). Genome sequence analysis of potential probiotic strain Leuconostoc lactis EFEL005 isolated from kimchi. J Microbiol. 2015 May;53(5):337-42. doi: 10.1007/s12275-015-5090-8. Epub 2015 May 3. PMID: 25935305. Saravanan, C., Shetty, P.K. (2015). Isolation and characterization of exopolysaccharide from Leuconostoc lactis KC117496 isolated from idli batter. Int J Biol Macromol. 2016 Sep;90:100-6. doi: 10.1016/j.ijbiomac.2015.02.007. Epub 2015 Feb 14. PMID: 25687478. Chen, Y.S., Wu, H.C., Lo, H.Y., Lin, W.C., Hsu, W.H., Lin, C.W., Lin, P.Y., Yanagida, F. (2012). Isolation and characterisation of lactic acid bacteria from jiang-gua (fermented cucumbers), a traditional fermented food in Taiwan. J Sci Food Agric. 2012 Aug 15;92(10):2069-75. doi: 10.1002/jsfa.5583. Epub 2012 Jan 23. PMID: 22271629.	ATCC 19256	Garvie, E.I. (1960). The genus Leuconostoc and its nomenclature. J. Dairy Res. 27, 283–292.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc mesenteroides*	*Leuconostoc mesenteroides* subsp. *mesenteroides*	Dairy	De Pasquale, I., Di Cagno, R., Buchin, S., De Angelis, M., Gobbetti, M. (2019). Use of autochthonous mesophilic lactic acid bacteria as starter cultures for making Pecorino Crotonese cheese: Effect on compositional, microbiological and biochemical attributes. Food Res Int. 2019 Feb;116:1344-1356. doi: 10.1016/j.foodres.2018.10.024. Epub 2018 Oct 9. PMID: 30716924. Seixas, F.N., Rios, E.A., Martinez de Oliveira, A.L., Beloti, V., Poveda, J.M. (2018). Selection of Leuconostoc strains isolated from artisanal Serrano Catarinense cheese for use as adjuncts in cheese manufacture. J Sci Food Agric. 2018 Aug;98(10):3899-3906. doi: 10.1002/jsfa.8907. Epub 2018 Feb 26. PMID: 29364508. Benheddi, W., Hellal, A. (2019). Technological characterization and sensory evaluation of a traditional Algerian fresh cheese clotted with Cynara cardunculus L. flowers and lactic acid bacteria. J Food Sci Technol. 2019 Jul;56(7):3431-3438. doi: 10.1007/s13197-019-03828-0. Epub 2019 Jun 10. PMID: 31274911; PMCID: PMC6581988. Silva, L.F., Casella, T., Gomes, E.S., Nogueira, M.C., De Dea Lindner, J., Penna, A.L. (2015). Diversity of lactic acid bacteria isolated from Brazilian water buffalo mozzarella cheese. J Food Sci. 2015 Feb;80(2):M411-7. doi: 10.1111/1750-3841.12771. Epub 2015 Jan 16. PMID: 25597646.	ATCC 8293	Van Tieghem, P.E.L. (1878). Sur la gomme de sucrerie. Ann. Sci. Nat. Bot., 6e Ser. 67, 180–202.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc mesenteroides*	*Leuconostoc mesenteroides* subsp. *mesenteroides*	Plant Based	Papadelli, M., Zoumpopoulou, G., Georgalaki, M., Anastasiou, R., Manolopoulou, E., Lytra, I., Papadimitriou, K., Tsakalidou, E. (2015). Evaluation of Two Lactic Acid Bacteria Starter Cultures for the Fermentation of Natural Black Table Olives (Olea europaea L cv Kalamon). Pol J Microbiol. 2015;64(3):265-71. PMID: 26638534. Pedersen, C.S. (1962). Fermentation of the Yugoslavian pickled cabbage. Appl Microbiol. 10, 86-9. Jung, J.Y., Lee, S.H., Lee, S.H., Jeon, C.O. (2012). Complete genome sequence of Leuconostoc mesenteroides subsp. mesenteroides strain J18, isolated from kimchi. J Bacteriol. 2012 Feb;194(3):730-1. doi: 10.1128/JB.06498-11. PMID: 22247530; PMCID: PMC3264068.	ATCC 8293	Van Tieghem, P.E.L. (1878). Sur la gomme de sucrerie. Ann. Sci. Nat. Bot., 6e Ser. 67, 180–202.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc mesenteroides*	*Leuconostoc mesenteroides* subsp. *mesenteroides*	Alcoholic Beverages	Lonvaud-Funel, A. & Strasser de Saad, A.M. (1982). Purification and Properties of a Malolactic Enzyme from a Strain of Leuconostoc mesenteroides Isolated from Grapes, APPLIED AND ENVIRONMENTAL MICROBIOLOGY, vol. 43, No. 2, p 357-361 Mtshali, P.S., Divol, B., du Toit, M. (2012). PCR detection of enzyme-encoding genes in euconostoc mesenteroides strains of wine origin, World J Microbiol Biotechnol, V.28, p. 1443–1449	ATCC 8293	Van Tieghem, P.E.L. (1878). Sur la gomme de sucrerie. Ann. Sci. Nat. Bot., 6e Ser. 67, 180–202.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc mesenteroides*	*Leuconostoc mesenteroides* subsp. *mesenteroides*	Meat	Samelis, J., Maurogenakis, F. and Metaxopoulos, J. (1994). Characterisation of lactic acid bacteria isolated from naturally fermented Greek dry salami. Int. J. Food Microbiol., 23, 179-196. Danilovic, B. et al. (2011). The characterisation of lactic acid bacteria during the fermentation of an artisan Serbian sausage (Petrovska Klobása). Meat Sci., 88, 668-674.	ATCC 8293	Van Tieghem, P.E.L. (1878). Sur la gomme de sucrerie. Ann. Sci. Nat. Bot., 6e Ser. 67, 180–202.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc mesenteroides*	*Leuconostoc mesenteroides* subsp.*cremoris*	Dairy	Frantzen, C.A., Kot, W., Pedersen, T.B., Ardö, Y.M., Broadbent, J.R., Neve, H., Hansen, L.H., Dal Bello, F., Østlie, H.M., Kleppen, H.P., Vogensen, F.K., Holo, H. (2017). Genomic Characterization of Dairy Associated Leuconostoc Species and Diversity of Leuconostocs in Undefined Mixed Mesophilic Starter Cultures. Front Microbiol. 2017 Feb 3;8:132. doi: 10.3389/fmicb.2017.00132. PMID: 28217118; PMCID: PMC5289962. Mainville, I., Robert, N., Lee, B., Farnworth, E.R. (2006). Polyphasic characterization of the lactic acid bacteria in kefir. Syst Appl Microbiol. 2006 Jan;29(1):59-68. doi: 10.1016/j.syapm.2005.07.001. Epub 2005 Aug 15. PMID: 16423657. Lazos, E.S. (1993). The fermentation of trahanas: a milk-wheat flour combination. Plant Foods Hum Nutr. 44, 45-62.	ATCC 19254	Garvie, E.I. (1983). Leuconostoc mesenteroides subsp. Cremoris (Knudsen and Sørensen) comb. nov. and Leuconostoc mesenteroides subsp. dextranicum Beijernick) comb. nov. Int. J. Syst. Bacteriol. 33, 118–119.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc mesenteroides*	*Leuconostoc mesenteroides* subsp.*dextranicum*	Dairy	Beukes, E.M., Bester, B.H., Mostert, J.F. (2001). The microbiology of South African traditional fermented milks. Int J Food Microbiol. 2001 Feb 15;63(3):189-97. doi: 10.1016/s0168-1605(00)00417-7. PMID: 11246902. Duan, Y., Tan, Z., Wang, Y., Li, Z., Li, Z., Qin, G., Huo, Y., Cai, Y. (2008). Identification and characterization of Lactic Acid Bacteria isolated from Tibetan Qula cheese. J Gen Appl Microbiol. 2008 Feb;54(1):51-60. doi: 10.2323/jgam.54.51. PMID: 18323681. Keenan, T.W. (1968). Production of acetic acid and other volatile compounds by Leucoostoc citrovorum and Leuconostoc dextranicum. Appl Microbiol. 16, 1881-5.	ATCC 19255	Garvie, E.I. (1983). Leuconostoc mesenteroides subsp. Cremoris (Knudsen and Sørensen) comb. nov. and Leuconostoc mesenteroides subsp. dextranicum Beijernick) comb. nov. Int. J. Syst. Bacteriol. 33, 118–119.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc palmae*		Alcoholic Beverages	Ehrmann, M.A., Freiding, S., Vogel, R.F. (2009). Leuconostoc palmae sp. nov., a novel lactic acid bacterium isolated from palm wine. Int. J. Syst. Evol. Microbiol. 59, 943-947.	DSM 21144	Ehrmann, M.A., Freiding, S., Vogel, R.F. (2009). Leuconostoc palmae sp. nov., a novel lactic acid bacterium isolated from palm wine. Int. J. Syst. Evol. Microbiol. 59, 943-947.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc pseudomesenteroides*		Dairy	Garofalo, C., Ferrocino, I., Reale, A., Sabbatini, R., Milanović, V., Alkić-Subašić, M., Boscaino, F., Aquilanti, L., Pasquini, M., Trombetta, M.F., Tavoletti, S., Coppola, R., Cocolin, L., Blesić, M., Sarić, Z., Clementi, F., Osimani, A. (2020). Study of kefir drinks produced by backslopping method using kefir grains from Bosnia and Herzegovina: Microbial dynamics and volatilome profile. Food Res Int. 2020 Nov;137:109369. doi: 10.1016/j.foodres.2020.109369. Epub 2020 Jun 1. PMID: 33233071. Câmara, S.P., Dapkevicius, A., Riquelme, C., Elias, R.B., Silva, C., Malcata, F.X., Dapkevicius, M. (2019). Potential of lactic acid bacteria from Pico cheese for starter culture development. Food Sci Technol Int. 2019 Jun;25(4):303-317. doi: 10.1177/1082013218823129. Epub 2019 Jan 15. PMID: 30646760. Frantzen, C.A., Kot, W., Pedersen, T.B., Ardö, Y.M., Broadbent, J.R., Neve, H., Hansen, L.H., Dal Bello, F., Østlie, H.M., Kleppen, H.P., Vogensen, F.K., Holo, H. (2017). Genomic Characterization of Dairy Associated Leuconostoc Species and Diversity of Leuconostocs in Undefined Mixed Mesophilic Starter Cultures. Front Microbiol. 2017 Feb 3;8:132. doi: 10.3389/fmicb.2017.00132. PMID: 28217118; PMCID: PMC5289962. Pedersen, T.B., Kot, W.P., Hansen, L.H., Sørensen, S.J., Broadbent, J.R., Vogensen, F.K., Ardö, Y. (2014). Genome Sequences of Two Leuconostoc pseudomesenteroides Strains Isolated from Danish Dairy Starter Cultures. Genome Announc. 2014 Jun 5;2(3):e00484-14. doi: 10.1128/genomeA.00484-14. PMID: 24903866; PMCID: PMC4047445. Callon, C., Millet, L., Montel, M.C. (2004). Diversity of lactic acid bacteria isolated from AOC Salers cheese. Journal of Dairy Research 71, 231-44. Abriouel, H., Martín-Platero, A., Maqueda, M., Valdivia, E., Martínez-Bueno, M. (2008). Biodiversity of the microbial community in a Spanish farmhouse cheese as revealed by culture-dependent and culture-independent methods. International Journal of Food Microbiology 127, 200-8. Sengun, I.Y., Nielsen, D.S., Karapinar, M., Jakobsen, M. (2009). Identification of lactic acid bacteria isolated from Tarhana, a traditional Turkish fermented food. International Journal of Food Microbiology 135, 105-11.	ATCC 12291	Farrow, J.A.E., Facklam, R.R., Collins, M.D. (1989). Nucleic acid homologies of some vancomycin-resistant leuconostocs and description of Leuconostoc citreum sp. nov. and Leuconostoc pseudomesenteroides. Int. J. Syst. Bacteriol. 39, 279–283.
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc pseudomesenteroides*		Alcoholic Beverages	Zhou, Q., Feng, F., Yang, Y., Zhao, F., Du, R., Zhou, Z., Han, Y. (2018). Characterization of a dextran produced by Leuconostoc pseudomesenteroides XG5 from homemade wine. Int J Biol Macromol. 2018 Feb;107(Pt B):2234-2241. doi: 10.1016/j.ijbiomac.2017.10.098. Epub 2017 Oct 16. PMID: 29051095. Wang, Y., Pan, L., Han, Y., Zhou, Z. (2018). Purification, characterization and antioxidant activity of dextran produced by Leuconostoc pseudomesenteroides from homemade wine. Carbohydr Polym. 2018 Oct 15;198:529-536. doi: 10.1016/j.carbpol.2018.06.116. Epub 2018 Jun 30. Erratum in: Carbohydr Polym. 2019 Jul 15;216:331. PMID: 30093031. Bora, S.S., Keot, J., Das, S., Sarma, K., Barooah, M. (2016). Metagenomics analysis of microbial communities associated with a traditional rice wine starter culture (Xaj-pitha) of Assam, India. 3 Biotech. 2016 Dec;6(2):153. doi: 10.1007/s13205-016-0471-1. Epub 2016 Jul 15. PMID: 28330225; PMCID: PMC4947050.	ATCC 12291	Farrow, J.A.E., Facklam, R.R., Collins, M.D. (1989). Nucleic acid homologies of some vancomycin-resistant leuconostocs and description of Leuconostoc citreum sp. nov. and Leuconostoc pseudomesenteroides. Int. J. Syst. Bacteriol. 39, 279–283.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Leuconostoc*	*Leuconostoc pseudomesenteroides*		Meat	Parente, E., Grieco, S., Crudele, M.A. (2001). Phenotypic diversity of lactic acid bacteria isolated from fermented sausages produced in Basilicata (Southern Italy). Journal of Applied Microbiology. 90, 943-52.	ATCC 12291	Farrow, J.A.E., Facklam, R.R., Collins, M.D. (1989). Nucleic acid homologies of some vancomycin-resistant leuconostocs and description of Leuconostoc citreum sp. nov. and Leuconostoc pseudomesenteroides. Int. J. Syst. Bacteriol. 39, 279–283.
Monera	*Firmicutes*	*Lactobacillaceae*	*Levilactobacillus*	*Levilactobacillus acidifarinae*		Bakery	Vancanneyt, M., Neysens, P., De Wachter, M., Engelbeen, K., Snauwaert, C., Cleenwerck, I., Van der Meulen, R., Hoste, B., Tsakalidou, E., De Vuyst, L., Swings, J. (2005). Lactobacillus acidifarinae sp. nov. and Lactobacillus zymae sp. nov., from wheat sourdoughs. Int J Syst Evol Microbiol. 55, 615-620.	LMG 2220	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Levilactobacillus*	*Levilactobacillus acidifarinae*		Plant Based	Nakayama, J., Hoshiko, H., Fukuda, M., Tanaka, H., Sakamoto, N., Tanaka, S., Ohue, K., Sakai, K., Sonomoto, K. (2007). Molecular monitoring of bacterial community structure in long-aged nukadoko: pickling bed of fermented rice bran dominated by slow-growing lactobacilli. J Biosci Bioeng. 2007 Dec;104(6):481-9. doi: 10.1263/jbb.104.481. PMID: 18215635.	DSM 19394	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Levilactobacillus*	*Levilactobacillus brevis*		Bakery	Coda, R., Rizzello, C.G., Nigro, F., De Angelis, M., Arnault, P., Gobbetti, M. (2008). Long-term fungal inhibitory activity of water-soluble extracts of Phaseolus vulgaris cv. Pinto and sourdough lactic acid bacteria during bread storage. Appl Environ Microbiol. 2008 Dec;74(23):7391-8.	ATCC 14869	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Levilactobacillus*	*Levilactobacillus brevis*		Meat	Benito, M.J., Serradilla, M.J., Ruiz-Moyano, S., Martín, A., Pérez-Nevado, F., Córdoba, M.G. (2008). Rapid differentiation of lactic acid bacteria from autochthonous fermentation of Iberian dry-fermented sausages. Meat Sci. 2008 Nov;80(3):656-61.	ATCC 14869	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Levilactobacillus*	*Levilactobacillus brevis*		Plant Based	Kim, J.Y., Lee, M.Y., Ji, G.E., Lee, Y.S., Hwang, K.T. (2009). Production of gamma-aminobutyric acid in black raspberry juice during fermentation by Lactobacillus brevis GABA100. Int J Food Microbiol. 2009 Mar 15;130(1):12-6.	ATCC 14869	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Levilactobacillus*	*Levilactobacillus brevis*		Plant Based	Barla, F., Koyanagi, T., Tokuda, N., Matsui, H., Katayama, T., Kumagai, H., Michihata, T., Sasaki, T., Tsuji, A., Enomoto, T. (2016). The γ-aminobutyric acid-producing ability under low pH conditions of lactic acid bacteria isolated from traditional fermented foods of Ishikawa Prefecture, Japan, with a strong ability to produce ACE-inhibitory peptides. Biotechnol Rep (Amst). 2016 Apr 9;10:105-110.	ATCC 14869	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Levilactobacillus*	*Levilactobacillus brevis*		Dairy	La Rivière, J.W., Kooiman, P. (1967). Kefiran, a novel polysaccharide produced in the kefir grain by Lactobacillus brevis. Arch Mikrobiol. 59(1):269-78.	ATCC 14869	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Levilactobacillus*	*Levilactobacillus brevis*		Plant Based	Pedersen, C.S., Niketic, G., Albury, M.N. (1962). Fermentation of the Yugoslavian pickled cabbage. Appl Microbiol. 10, 86-9.	ATCC 14869	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Levilactobacillus*	*Levilactobacillus brevis*		Alcoholic Beverages	Pilone, G.J., Kunkee, R.E. and Webb A.D. (1966): Chemical Characterization of Wines Fermented with Various Malo-lactic Bacteria, APPLIED MICROBIOLOGY, Vol. 14, No. 4, p. 608-615. Pardo, I. and Zuniga, M (1992). Lactic Acid Bacteria in Spanish Red Rose and White Musts and Wines, JOURNAL OF FOOD SCIENCE, Vol. 57, No. 2, p. 392-396 S.	ATCC 14869	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Levilactobacillus*	*Levilactobacillus brevis*		Alcoholic Beverages	De Cort, S., Kumara, H.M., Verachtert, H. (1994). Localization and Characterization of alpha-Glucosidase Activity in Lactobacillus brevis. Appl Environ Microbiol. 60(9):3074-8.	ATCC 14869	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Levilactobacillus*	*Levilactobacillus hammesii*		Bakery	Valcheva, R., Korakli, M., Onno, B., Prévost, H., Ivanova, I., Ehrmann, M.A., Dousset, X., Gänzle, M.G., Vogel, R.F. (2005). Lactobacillus hammesii sp. nov., isolated from French sourdough. Int. J. Syst. Evol. Microbiol. 55, 763-767.	DSM 16381	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Levilactobacillus*	*Levilactobacillus namurensis*		Bakery	Scheirlinck, I., Van der Meulen, R., Van Schoor, A., Cleenwerck, I., Huys, G., Vandamme, P., Devuyst, L., Vancanneyt, M. (2007). Lactobacillus namurensis sp. nov., isolated from a traditional Belgian sourdough. Int. J. Syst. Evol. Microbiol. 57, 223-227.	DSM 19117	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Levilactobacillus*	*Levilactobacillus parabrevis*		Dairy	Vancanneyt, M., Naser, S.M., Engelbeen, K., De Wachter, M., Van der Meulen, R., Cleenwerck, I., Hoste, B., De Vuyst, L., Swings, J. (2006). Reclassification of Lactobacillus brevis strains LMG 11494 and LMG 11984 as Lactobacillus parabrevis sp. nov. Int. J. Syst. Evol. Microbiol. 56, 1553-1557	ATCC 53295	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Levilactobacillus*	*Levilactobacillus parabrevis*		Plant Based	Pedersen, C.S., Niketic, G., Albury, M.N. (1962). Fermentation of the Yugoslavian pickled cabbage. Appl Microbiol. 10, 86-9.	ATCC 53295	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Levilactobacillus*	*Levilactobacillus senmaizukei*		Plant Based	Hiraga, K., Ueno,Y., Sukontasing, S., Tanasupawat, S., Oda, K. (2008). Lactobacillus senmaizukei sp. nov., isolated from Japanese pickle. Int. J. Syst. Evol. Microbiol. 58, 1625-1629.	NBRC 103853	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Levilactobacillus*	*Levilactobacillus spicheri*		Bakery	Meroth, C.B., Hammes, W.P., Hertel, C. (2004). Characterisation of the microbiota of rice sourdoughs and description of Lactobacillus spicheri sp. nov. Syst. Appl. Microbiol. 27, 151-159.	DSM 15429	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Levilactobacillus*	*Levilactobacillus zymae*		Plant Based	Cheng, L., Luo, J., Li, P., Yu, H., Huang, J., Luo, L. (2014). Microbial diversity and flavor formation in onion fermentation. Food Funct. 5(9):2338-47.	LMG 22198	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Levilactobacillus*	*Levilactobacillus zymae*		Bakery	De Vuyst, L., Vancanneyt, M. (2007). Biodiversity and identification of sourdough lactic acid bacteria. Food Microbiol. 2007 Apr;24(2):120-7. doi: 10.1016/j.fm.2006.07.005. Epub 2006 Sep 11. PMID: 17008154	LMG 22198	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Ligilactobacillus*	*Ligilactobacillus acidipiscis*		Dairy	Asteri, I.A., Robertson, N., Kagkli, D.M., Andrewes, P., Nychas, G., Coolbear, T., Holland, R., Crow, V., Tsakalidou. E. (2009). Technological and flavour potential of cultures isolated from traditional Greek cheeses – A pool of novel species and starters. International Dairy Journal 19, 595-604. Fontana, C., Cappa, F., Rebecchi, A., Cocconcelli, P.S. (2010). Surface microbiota analysis of Taleggio, Gorgonzola, Casera, Scimudin and Formaggio di Fossa Italian cheeses. International Journal of Food Microbiology 138, 205-21.	CIP 106750	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Ligilactobacillus*	*Ligilactobacillus acidipiscis*		Seafood	Tanasupawat, S., Shida, O., Okada, S., Komagata, K. (2000). Lactobacillus acidipiscis sp. nov. and Weissella thailandensis sp. nov., isolated from fermented fish in Thailand. International Journal of Systematic and Evolutionary Microbiology 50, 1479-85.	CIP 106750	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Ligilactobacillus*	*Ligilactobacillus fermentum*		Dairy	Randazzo, C.L., Torriani, S., Akkermans, A.D., de Vos, W.M., Vaughan, E.E. (2002). Diversity, dynamics, and activity of bacterial communities during production of an artisanal Sicilian cheese as evaluated by 16S rRNA analysis. Appl Environ Microbiol. 2002 Apr;68(4):1882-92.	ATCC 14931	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Ligilactobacillus*	*Ligilactobacillus fermentum*		Plant Based	Endo, A., Mizuno, H., Okada, S. (2008). Monitoring the bacterial community during fermentation of sunki, an unsalted, fermented vegetable traditional to the Kiso area of Japan. Lett Appl Microbiol. 2008 Sep;47(3):221-6.	ATCC 14931	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Ligilactobacillus*	*Ligilactobacillus fermentum*		Meat	Zhang, X., Kong, B., Xiong, Y.L. (2007). Production of cured meat color in nitrite-free Harbin red sausage by Lactobacillus fermentum fermentation. Meat Sci. 2007 Dec;77(4):593-8.	ATCC 14931	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Ligilactobacillus*	*Ligilactobacillus fermentum*		Plant Based	Aegerter, P., Dunlap, C. (1980). Culture of five commonly used Acid-producing bacteria on banana pulp. Appl Environ Microbiol. 1980 May;39(5):937-42.	ATCC 14931	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Ligilactobacillus*	*Ligilactobacillus murinus*		Plant Based	Wang, Z., Zhang, X.J., Zhou, G.Y., Wang, J.Y., Li-Hua, A.I., Song, P. (2008). Collection and standardized sequence of lactic acid bacteria in Sichuan areas for fermented pickles. Sichuan Food and Fermentation. 44(3): 5-8. (In Chinese)	ATCC 35020	Zheng, J., Wittouck, S., Salvetti, E. et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae[J]. Int J Syst Evol Microbiol, 2020, 70:2782-2858.
Monera	*Firmicutes*	*Lactobacillaceae*	*Ligilactobacillus*	*Ligilactobacillus pobuzihii*		Plant Based	Chen, Y.S., Miyashita, M., Suzuki, K., Sato, H., Hsu, J.S., Yanagida, F. (2010). Lactobacillus pobuzihii sp. nov., isolated from pobuzihi (fermented cummingcordia). Int. J. Syst. Evol. Microbiol. 60, 1914-1917.	NBRC 103219	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Ligilactobacillus*	*Ligilactobacillus salivarius*		Alcoholic Beverages	Kačániová, M., Hleba, L., Pochop, J., Kádasi-Horáková, M., Fikselová, M., Rovná, K. (2012). Determination of wine microbiota using classical method, polymerase chain method and Step One Real-Time PCR during fermentation process. J Environ Sci Health B. 2012;47(6):571-8.	ATCC 11741	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Ligilactobacillus*	*Ligilactobacillus salivarius*		Dairy	Vasala, A., Panula, J., Neubauer, P. (2005). Efficient lactic acid production from high salt containing dairy by-products by Lactobacillus salivarius ssp. salicinius with pre-treatment by proteolytic microorganisms. Journal of Biotechnology 117, 421-431.	ATCC 11741	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Ligilactobacillus*	*Ligilactobacillus salivarius*		Plant Based	Coulin, P., Farah, Z., Assanvo, H., Spillmann, H., Puhan, Z. (2006). Characterisation of the microflora of attiéké, a fermented cassava product, during traditional small-scale preparation. Int J Food Microbiol. 106, 131-6.	ATCC 11741	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Limosilactobacillus*	*Limosilactobacillus fermentum*		Bakery	Khetarpaul, N., Chauhan, B.M. (1991). Biological utilisation of pearl millet flour fermented with yeasts and lactobacilli. Plant Foods Hum Nutr. 41, 309-19.	ATCC 14931	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Limosilactobacillus*	*Limosilactobacillus frumenti*		Plant Based	Müller, M.R.A., Ehrmann, M.A., Vogel, R.F. (2000). Lactobacillus frumenti sp. nov., a new lactic acid bacterium isolated from rye-bran fermentations with a long fermentation period. Int. J. Syst. Evol. Microbiol. 50, 2127-2133.	DSM 13145	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Limosilactobacillus*	*Limosilactobacillus mucosae*		Alcoholic Beverages	Vieira-Dalodé, G. (2007). Lactic acid bacteria and yeasts associated with gowé production from sorghum in Bénin. J Appl Microbiol. 103, 342-9.	DSM 13345	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Limosilactobacillus*	*Limosilactobacillus panis*		Bakery	Wiese, B.J., Strohmar, W., Rainey, F.A., Diekmann, H. (1996). Lactobacillus panis sp. nov., from sourdough with a long fermentation period. Int. J. Syst. Bacteriol. 46, 449-453.	DSM 6035	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Limosilactobacillus*	*Limosilactobacillus pontis*		Bakery	Vogel, R.F., Böcker, G., Stolz, P., Ehrmann, M., Fanta, D., Ludwig, W., Pot, B., Kersters, K., Schleifer, K.H., Hammes, W.P. (1994). Identification of lactobacilli from sourdough and description of Lactobacillus pontis sp. nov. Int. J. Syst. Bacteriol. 44, 223-229.	DSM 8475	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Limosilactobacillus*	*Limosilactobacillus reuteri*		Seafood	Saithong, P., Panthavee, W., Boonyaratanakornkit, M., Sikkhamondhol, C. (2010). Use of a starter culture of lactic acid bacteria in plaa-som, a Thai fermented fish. J Biosci Bioeng. 2010 Nov;110(5):553-7.	ATCC 23272	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Limosilactobacillus*	*Limosilactobacillus reuteri*		Bakery	Ehrmann, M.A., Vogel, R.F. (2005). Molecular taxonomy and genetics of sourdough lactic acid bacteria Trends in Food Science & Technology 16, 31-42.	ATCC 23272	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Limosilactobacillus*	*Limosilactobacillus reuteri*		Dairy	Reuter, G. (1997). Present and future of probiotics in Germany and in Central Europe. Biosci. Microflora, 16, 43-51.	ATCC 23272	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Limosilactobacillus*	*Limosilactobacillus secaliphilus*		Bakery	Ehrmann, M.A., Brandt, M., Stolz, P., Vogel, R.F., Korakli, M. (2007). Lactobacillus secaliphilus sp. nov., isolated from type II sourdough fermentation. Int. J. Syst. Evol. Microbiol. 57, 745-750.	DSM 17896	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Liquorilactobacillus*	*Liquorilactobacillus cacaonum*		Plant Based	De Bruyne, K., Camu, N., De Vuyst, L., Vandamme, P. (2009). Lactobacillus fabifermentans sp. nov. and Lactobacillus cacaonum sp. nov., isolated from Ghanaian cocoa fermentations. Int. J. Syst. Evol. Microbiol. 59, 7-12.	DSM 21116	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Liquorilactobacillus*	*Liquorilactobacillus ghanensis*		Plant Based	Nielsen, D.S., Schillinger, U., Franz, C.M.A.P., Bresciani, J., Amoa-Awua, W., Holzapfel, W.H., Jakobsen, M. (2007). Lactobacillus ghanensis sp. nov., a motile lactic acid bacterium isolated from Ghanaian cocoa fermentations. Int. J. Syst. Evol. Microbiol. 57, 1468-1472.	DSM 18630	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Liquorilactobacillus*	*Liquorilactobacillus hordei*		Plant Based	Gulitz, A., Stadie, J., Wenning, M., Ehrmann, M.A., Vogel, R.F. (2011). The microbial diversity of water kefir. Int J Food Microbiol. 2011 Dec 15;151(3):284-8.	UCC128 - DSM 19519 - JCM 16179 - LMG 24241	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Liquorilactobacillus*	*Liquorilactobacillus hordei*		Dairy	Hsieh, H.H., Wang, S.Y., Chen, T.L., Huang, Y.L., Chen, M.J. (2012). Effects of cow's and goat's milk as fermentation media on the microbial ecology of sugary kefir grains. Int J Food Microbiol. Jun 15;157(1):73-81.	UCC128 - DSM 19519 - JCM 16179 - LMG 24241	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Descriptionof 23 novel genera, emended description of the genusLactobacillus Beijerinck 1901, and union of Lactobacillaceaeand Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Liquorilactobacillus*	*Liquorilactobacillus hordei*		Alcoholic Beverages	Rouse, S., Canchaya, C., Van Sinderen, D. (2008). Lactobacillus hordei sp. nov., a bacteriocinogenic strain isolated from malted barley. Int. J. Syst. Evol. Microbiol. 58, 2013-2017.	UCC128 - DSM 19519 - JCM 16179 - LMG 24241	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Liquorilactobacillus*	*Liquorilactobacillus mali*		Alcoholic Beverages	König, H., Unden, G., Fröhlich, J. (2009). Biology of Microorganisms on Grapes, in Must and in Wine. Springer-Verlag DOI: 10.1007/978-3-540-85463-0	ATCC 27053	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Liquorilactobacillus*	*Liquorilactobacillus mali*		Alcoholic Beverages	König, H., Unden, G., Fröhlich, J. (2009). Biology of Microorganisms on Grapes, in Must and in Wine. Springer-Verlag DOI: 10.1007/978-3-540-85463-0 Couto, J.A., Hogg, T.A. (1994). Diversity of ethanol-tolerant lactobacilli isolated from Douro fortified wine: clustering and identification by numerical analysis of electrophoretic protein profiles. J of Appliied Bacteriology 76, 487-491.	ATCC 27053	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Liquorilactobacillus*	*Liquorilactobacillus nagelii*		Alcoholic Beverages	Laureys, D., De Vuyst, L. (2017). The water kefir grain inoculum determines the characteristics of the resulting water kefir fermentation process. J Appl Microbiol. 2017 Mar;122(3):719-732. doi: 10.1111/jam.13370. PMID: 27930854	ATCC 700692	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Liquorilactobacillus*	*Liquorilactobacillus nagelii*		Plant Based	Papalexandratou, Z., Camu, N., Falony, G., de Vuyst, L. (2011). comparison of the bacterial species diversity of spontaneous cocoa bean fermentations carried out at selected farms in Ivory Coast and Brazil. Food Microbiol 28 964-73.	ATCC 700692	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Liquorilactobacillus*	*Liquorilactobacillus oeni*		Alcoholic Beverages	Manes-Lazaro, R., Ferrer, S., Rossello-Mora, R., Pardo, I. (2009). Lactobacillus oeni sp. nov., from wine. Int. J. Syst. Evol. Microbiol. 59, 2010-2014.	DSM 19972	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Liquorilactobacillus*	*Liquorilactobacillus satsumensis*		Plant Based	Endo, A., Okada, S. (2005). Lactobacillus satsumensis sp. nov., isolated from mashes of shochu, a traditional Japanese distilled spirit made from fermented rice and other starchy materials. Int. J. Syst. Evol. Microbiol. 55, 83-85.	NRIC 0604	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Loigolactobacillus*	*Loigolactobacillus coryniformis*		Dairy	Hegazi, F.Z., Abo-Elnaga, I.G. (1980). Characters of Lactobacillus coryniformis, isolated from an Iraqi cheese. Zentralbl Bakteriol Naturwiss. 135, 205-11.	ATCC 25602	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Loigolactobacillus*	*Loigolactobacillus coryniformis*		Meat	Samelis, J., Maurogenakis, F. and Metaxopoulos, J. (1994). Characterisation of lactic acid bacteria isolated from naturally fermented Greek dry salami. Int. J. Food Microbiol., 23, 179-196.	ATCC 25602	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Oenococcus*	*Oenococcus oeni*		Alcoholic Beverages	Breniaux, M., Dutilh, L., Petrel, M., Gontier, E., Campbell-Sills, H., Deleris-Bou, M., Krieger, S., Teissedre, P.L., Jourdes, M., Reguant, C., Lucas, P. (2018). Adaptation of two groups of Oenococcus oeni strains to red and white wines: the role of acidity and phenolic compounds. J Appl Microbiol. 2018 Oct;125(4):1117-1127. doi: 10.1111/jam.13946. Epub 2018 Aug 16. PMID: 29904988	ATCC 23279 DSM 20252	Dicks, L.M. (1995). Proposal to reclassify Leuconostoc oenos as Oenococcus oeni [corrig.] gen. nov., comb. nov. Int J Syst Bacteriol. 45, 395-7.
Monera	*Firmicutes*	*Lactobacillaceae*	*Oenococcus*	*Oenococcus oeni*		Plant Based	Coton, M., Pawtowski, A., Taminiau, B., Burgaud, G., Deniel, F., Coulloumme-Labarthe, L., Fall, A., Daube, G., Coton, E. (2017). Unraveling microbial ecology of industrial-scale Kombucha fermentations by metabarcoding and culture-based methods. FEMS Microbiol Ecol. 2017 May 1;93(5). doi: 10.1093/femsec/fix048. PMID: 28430940.	ATCC 23279 DSM 20252	Dicks, L.M. (1995). Proposal to reclassify Leuconostoc oenos as Oenococcus oeni [corrig.] gen. nov., comb. nov. Int J Syst Bacteriol. 45, 395-7.
Monera	*Firmicutes*	*Lactobacillaceae*	*Paucilactobacillus*	*Paucilactobacillus suebicus*		Plant Based	Kleynmans, U., Heinzl, H., Hammes, W.P. (1989). Lactobacillus suebicus sp. nov., an obligately heterofermentative Lactobacillus species isolated from fruit mashes. Syst. Appl. Microbiol. 11, 267-271.	DSM 5007	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Paucilactobacillus*	*Paucilactobacillus vaccinostercus*		Plant Based	Papalexandratou, Z., Camu, N., Falony, G., de Vuyst, L. (2011). Comparison of the bacterial species diversity of spontaneous cocoa bean fermentations carried out at selected farms in Ivory Coast and Brazil. Food Microbiol 28 964-73.	ATCC 33310	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Paucilactobacillus*	*Paucilactobacillus vaccinostercus*		Plant Based	Arici, M., Coskun, F. (2001). Hardaliye: Fermented grape juice as a traditional Turkish beverage. Food Microbiology 18, 417–421.	ATCC 33310	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Paucilactobacillus*	*Paucilactobacillus vaccinostercus*		Plant Based	Abriouel, H., Benomar, N., Lucas, R., Gálvez, A. (2011). Culture-independent study of the diversity of microbial populations in brines during fermentation of naturally-fermented Aloreña green table olives. Int. J. Food Microbiol. Jan 5;144(3):487-96. doi: 10.1016/j.ijfoodmicro.2010.11.006.	ATCC 33310	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus acidilactici*		Dairy	Olajugbagbe, T.E., Elugbadebo, O.E., Omafuvbe, B.O. (2020). Probiotic potentials of Pediococuss acidilactici isolated from wara; A Nigerian unripened soft cheese. Heliyon. 2020 Sep 14;6(9):e04889. doi: 10.1016/j.heliyon.2020.e04889. PMID: 32984599; PMCID: PMC7498756. García-Cano, I., Rocha-Mendoza, D., Kosmerl, E., Jiménez-Flores, R. (2020). Purification and characterization of a phospholipid-hydrolyzing phosphoesterase produced by Pediococcus acidilactici isolated from Gouda cheese. J Dairy Sci. 2020 May;103(5):3912-3923. doi: 10.3168/jds.2019-17965. Epub 2020 Mar 5. PMID: 32147264. Morales-Estrada, A.I., Lopez-Merino, A., Gutierrez-Mendez, N., Ruiz, E.A., Contreras-Rodriguez, A. (2016). Partial Characterization of Bacteriocin Produced by Halotolerant Pediococcus acidilactici Strain QC38 Isolated from Traditional Cotija Cheese. Pol J Microbiol. 2016 Aug 26;65(3):279-285. doi: 10.5604/17331331.1215607. PMID: 29334047.	ATCC 33314 DSM 19927	Lindner, P. (1887). Über ein neues in Malzmaischen vorkommendes, milchsäurebildendes Ferment. Wochenschrift fur Brauerei 4, 437-440.
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus acidilactici*		Meat	LEroy, F. (2006). Functional meat starter cultures for improved sausage fermentation. Int J Food Microbiol. 106, 270-85.	ATCC 33314 DSM 19927	Lindner, P. (1887). Über ein neues in Malzmaischen vorkommendes, milchsäurebildendes Ferment. Wochenschrift fur Brauerei 4, 437-440.
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus acidilactici*		Bakery	Edema, M.O., Sanni, A.I. (2008). Functional properties of selected starter cultures for sour maize bread. Food Microbiol. Jun;25(4):616-25. doi: 10.1016/j.fm.2007.12.006. Epub 2008 Jan 29. PMID: 18456117.	ATCC 33314 DSM 19927	Lindner, P. (1887). Über ein neues in Malzmaischen vorkommendes, milchsäurebildendes Ferment. Wochenschrift fur Brauerei 4, 437-440.
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus acidilactici*		Plant Based	Onda, T. et al. (2003). Analysis of lactic acid bacterial flora during Miso fermentation. Food Sci. Technol. Res., 9, 17-24.	ATCC 33314 DSM 19927	Lindner, P. (1887). Über ein neues in Malzmaischen vorkommendes, milchsäurebildendes Ferment. Wochenschrift fur Brauerei 4, 437-440.
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus acidilactici*		Plant Based	FAO. (1998). Fermented fruits and vegetables: A global perspective-Chapter 2: Basic principles of fermentation. FAO Agricultural Services Bulletin No. 134. Li, X. et al. (2017). Characteristics of microbial community and aroma compounds in traditional fermentation of Pixian broad bean paste as compared to industrial fermentation. Int. J. Food Prop., 20, S2520-S2531. Simsek, Ö., Özel, S. and Con, A.H. (2017). Comparison of lactic acid bacteria diversity during the fermentation of Tarhana produced at home and on a commercial scale. Food Sci. Technol., 26, 181-187.	ATCC 33314 DSM 19927	Lindner, P. (1887). Über ein neues in Malzmaischen vorkommendes, milchsäurebildendes Ferment. Wochenschrift fur Brauerei 4, 437-440.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus damnosus*		Alcoholic Beverages	Walling, E., Gindreau, E., Lonvaud-Funel, A. (2005). A putative glucan synthase gene dps detected in exopolysaccharide-producing Pediococcus damnosus and Oenococcus oeni strains isolated from wine and cider. International Journal of Food Microbiology,Volume 98, Issue 1. 2005. Pages 53-62.	DSMZ 20331	Validation list no. 25. Int. J. Syst. Bacteriol. 38: 220-222. (1988). Back W. Zur taxonomie der gattung Pediococcus. The phenotype and genotype limits of the types of Pediococcus previously identified together with the description of a new sub-race which is detrimental to beer quality: Pediococcus inopinatus. Brauwissenschaft 31: 237-250, 312-320, 336-343, 1978.
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus damnosus*		Alcoholic Beverages	Kajala, I., Bergsveinson, J., Friesen, V., Redekop, A., Juvonen, R., Storgårds, E., Ziola, B. (2018). Lactobacillus backii and Pediococcus damnosus isolated from 170-year-old beer recovered from a shipwreck lack the metabolic activities required to grow in modern lager beer. FEMS Microbiol Ecol. 2018 Jan 1;94(1). doi: 10.1093/femsec/fix152. PMID: 29126241	DSMZ 20331 ATCC 29358	FEMS Microbiol Lett. (1990). Aug;58(3):255-62. The phylogeny of Aerococcus and Pediococcus as determined by 16S rRNA sequence analysis: description of Tetragenococcus gen. nov. Collins MD, Williams AM, Wallbanks S.
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus damnosus*		Alcoholic Beverages	Vigentini, I., Praz, A., Domeneghetti, D., Zenato, S., Picozzi, C., Barmaz, A., Foschino, R. (2016). Characterization of malolactic bacteria isolated from Aosta Valley wines and evidence of psychrotrophy in some strains. J Appl Microbiol. 2016 Apr;120(4):934-45. doi: 10.1111/jam.13080. PMID: 26820246. Lonvaud-Funel, A., Joyeux, A. and Ledoux, O. (1991). Specific enumeration of lactic acid bacteria in fermenting grape must and wine by colony hybridization with non-isotopic DNA Probes, Journal of Applied Bacteriology, Vol. 71, p. 501-509	DSMZ 20331 ATCC 29358	FEMS Microbiol Lett. (1990). Aug;58(3):255-62. The phylogeny of Aerococcus and Pediococcus as determined by 16S rRNA sequence analysis: description of Tetragenococcus gen. nov. Collins MD, Williams AM, Wallbanks S.
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus inopinatus*		Plant Based	Park, J.M., Shin, J.H., Lee, D.W. et al. (2010). Identification of the lactic acid bacteria in Kimchi according to initial and over-ripened fermentation using PCR and 16S rRNA gene sequence analysis. Food Sci Biotechnol 19, 541–546.	DSMZ 20285 ATCC 49902	Validation list no. 25. Int. J. Syst. Bacteriol. 38: 220-222, (1988). Back W. Zur taxonomie der gattung Pediococcus. The phenotype and genotype limits of the types of Pediococcus previously identified together with the description of a new sub-race which is detrimental to beer quality: Pediococcus inopinatus. Brauwissenschaft 31: 237-250, 312-320, 336-343, 1978.
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus inopinatus*		Alcoholic Beverages	Petri, A., Pfannebecker, J., Fröhlich, J., König, H. (2012). Fast identification of wine related lactic acid bacteria by multiplex PCR. Food Microbiol. 2013 Feb;33(1):48-54. doi: 10.1016/j.fm.2012.08.011. Epub 2012 Sep 12. PMID: 23122500. Dicks, L.M.T. and Endo, A. (2009). Taxonomic Status of Lactic Acid Bacteria in Wine and Key Characteristics to Differentiate Species, S. Afr. J. Enol. Vitic., Vol. 30, No. 1	DSMZ 20285 ATCC 49902	Validation list no. 25. Int. J. Syst. Bacteriol. 38: 220-222, (1988). Back W. Zur taxonomie der gattung Pediococcus. The phenotype and genotype limits of the types of Pediococcus previously identified together with the description of a new sub-race which is detrimental to beer quality: Pediococcus inopinatus. Brauwissenschaft 31: 237-250, 312-320, 336-343, 1978.
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus inopinatus*		Dairy	El-Baradei, G., Delacroix-Buchet, A., Ogier, J.C. (2007). Biodiversity of bacterial ecosystems in traditional Egyptian Domiati cheese. Appl Environ Microbiol. 2007 Feb;73(4):1248-55. doi: 10.1128/AEM.01667-06. Epub 2006 Dec 22. PMID: 17189434; PMCID: PMC1828670.	DSMZ 20285 ATCC 49902	Validation list no. 25. Int. J. Syst. Bacteriol. 38: 220-222, (1988). Back W. Zur taxonomie der gattung Pediococcus. The phenotype and genotype limits of the types of Pediococcus previously identified together with the description of a new sub-race which is detrimental to beer quality: Pediococcus inopinatus. Brauwissenschaft 31: 237-250, 312-320, 336-343, 1978.
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus parvulus*		Alcoholic Beverages	Arevalo-Villena, M., Bartowsky, E.J., Capone, D., Sefton, M.A. (2010). Production of indole by wine-associated microorganisms under oenological conditions.Food Microbiol 27(5):685-90. Edwards, C.G., Peterson, J.C., Boylston, T.D., Vasile, T.D. (1994). Interactions Between Leuconostoc oenos and Pediococcus spp. During Vinification of Red Wines, Am J Enol Vitic, Vol. 45, p. 49-55	ATCC 19371 DSM 20332	Gunther, H.L., White, H.R. (1961). The cultural and physiological characters of the pediococci. J. Gen. Microbiol. 26:185-197.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus parvulus*		Plant Based	Lucena-Padrós, H., Ruiz-Barba, J.L. (2019). Microbial biogeography of Spanish-style green olive fermentations in the province of Seville, Spain. Food Microbiol. Sep;82:259-268. doi: 10.1016/j.fm.2019.02.004. Epub 2019 Feb 20. PMID: 31027782. Abriouel, H., Benomar, N., Cobo, A., Caballero, N., Fernández Fuentes, M.Á., Pérez-Pulido, R., Gálvez, A. (2012). Characterization of lactic acid bacteria from naturally-fermented Manzanilla Aloreña green table olives. Food Microbiol. Dec;32(2):308-16. doi: 10.1016/j.fm.2012.07.006. Epub 2012 Jul 31. PMID: 22986194.	ATCC 19371 DSM 20332	Gunther, H.L., White, H.R. (1961). The cultural and physiological characters of the pediococci. J. Gen. Microbiol. 26:185-197.
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus pentosaceus*		Meat	Leroy, F. (2006). Functional meat starter cultures for improved sausage fermentation. Int J Food Microbiol. 106, 270-85.	ATCC 33316 DSM 20336	Mees, R.H. (1934). Onderzoekingen over de Biersarcina. Thesis. Technical University Delft, Holland, pp. 1-110.
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus pentosaceus*		Seafood	Paludan-Müller, C. (1999). Characterization of lactic acid bacteria isolated from a Thai low-salt fermented fish product and the role of garlic as substrate for fermentation. Int J Food Microbiol. 46, 219-29.	ATCC 33316 DSM 20336	Mees, R.H. (1934). Onderzoekingen over de Biersarcina. Thesis. Technical University Delft, Holland, pp. 1-110.
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus pentosaceus*		Plant Based	Xu, X., Luo, D., Bao, Y., Liao, X., Wu, J. (2018). Characterization of Diversity and Probiotic Efficiency of the Autochthonous Lactic Acid Bacteria in the Fermentation of Selected Raw Fruit and Vegetable Juices. Front Microbiol. 2018 Oct 23;9:2539. doi: 10.3389/fmicb.2018.02539. PMID: 30405588; PMCID: PMC6205992. Hong, S.W., Choi, Y.J., Lee, H.W., Yang, J.H., Lee, M.A. (2016). Microbial Community Structure of Korean Cabbage Kimchi and Ingredients with Denaturing Gradient Gel Electrophoresis. J Microbiol Biotechnol. 2016 Jun 28;26(6):1057-62. doi: 10.4014/jmb.1512.12035. PMID: 26907755	ATCC 33316 DSM 20336	Mees, R.H. (1934). Onderzoekingen over de Biersarcina. Thesis. Technical University Delft, Holland, pp. 1-110.
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus pentosaceus*		Alcoholic Beverages	Rodriguez, A.V. and Manca de Nadra, M.C. (1994). Sugar and organic acid metabolism in mixed cultures of Pediococcus pentosaceus and Leuconostoc oenos isolated from wine, Journal of Applied Bacteriology, Journal of Applied Bacteriology, vol. 77, p. 61-66 Lui, H.C. & Lui, S.S.T. (1981) Effects of malo-lactic fermentative bacteria on the acidity of white wine, Taiwania, Vol. 26.	ATCC 33316 DSM 20336	Mees, R.H. (1934). Onderzoekingen over de Biersarcina. Thesis. Technical University Delft, Holland, pp. 1-110.
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus pentosaceus*		Alcoholic Beverages	Das, A.J., Das, M.J., Miyaji, T., Deka, S.C. (2019). Growth and metabolic characterization of four lactic acid bacteria species isolated from rice beer prepared in Assam, India. Access Microbiol. 2019 May 29;1(4):e000028. doi: 10.1099/acmi.0.000028. PMID: 32974521; PMCID: PMC7470291.	ATCC 33316 DSM 20336	Mees, R.H. (1934). Onderzoekingen over de Biersarcina. Thesis. Technical University Delft, Holland, pp. 1-110.
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus pentosaceus*		Dairy	Gantzias, C., Lappa, I.K., Aerts, M., Georgalaki, M., Manolopoulou, E., Papadimitriou, K., De Brandt, E., Tsakalidou, E., Vandamme, P. (2020). MALDI-TOF MS profiling of non-starter lactic acid bacteria from artisanal cheeses of the Greek island of Naxos. Int J Food Microbiol. 2020 Jun 16;323:108586. doi: 10.1016/j.ijfoodmicro.2020.108586. Epub 2020 Mar 9. PMID: 32199192. Guarrasi, V., Sannino, C., Moschetti, M., Bonanno, A., Di Grigoli, A., Settanni, L. (2017). The individual contribution of starter and non-starter lactic acid bacteria to the volatile organic compound composition of Caciocavallo Palermitano cheese. Int J Food Microbiol. 2017 Oct 16;259:35-42. doi: 10.1016/j.ijfoodmicro.2017.07.022. Epub 2017 Jul 31. PMID: 28783535.	ATCC 33316 DSM 20336	Mees, R.H. (1934). Onderzoekingen over de Biersarcina. Thesis. Technical University Delft, Holland, pp. 1-110.
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus pentosaceus*		Bakery	Gong, Y., Qi, X. (2020). A study revealing volatile aroma produced by Pediococcus pentosaceus in dough fermentation. Food Sci Nutr. 2020 Aug 3;8(9):5077-5085. doi: 10.1002/fsn3.1807. PMID: 32994968; PMCID: PMC7500783.	ATCC 33316 DSM 20336	Mees, R.H. (1934). Onderzoekingen over de Biersarcina. Thesis. Technical University Delft, Holland, pp. 1-110.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus pentosaceus*		Plant Based	Onda, T. et al. (2003). Analysis of lactic acid bacterial flora during Miso fermentation. Food Sci. Technol. Res., 9, 17-24.	ATCC 33316 DSM 20336	Mees, R.H. (1934). Onderzoekingen over de Biersarcina. Thesis. Technical University Delft, Holland, pp. 1-110.
Monera	*Firmicutes*	*Lactobacillaceae*	*Pediococcus*	*Pediococcus pentosaceus*		Plant Based	FAO. (1998). Fermented fruits and vegetables: A global perspective-Chapter 2: Basic principles of fermentation. FAO Agricultural Services Bulletin No. 134.	ATCC 33316 DSM 20336	Mees, R.H. (1934). Onderzoekingen over de Biersarcina. Thesis. Technical University Delft, Holland, pp. 1-110.
Monera	*Firmicutes*	*Lactobacillaceae*	*Schleiferilactobacillus*	*Schleiferilactobacillus harbinensis*		Plant Based	Miyamoto, M., Seto, Y., Hao, D.H., Teshima, T., Sun, Y.B., Kabuki, T., Yao, L.B., Nakajima, H. (2005). Lactobacillus harbinensis sp. nov., consisted of strains isolated from traditional fermented vegetables 'Suan cai' in Harbin, Northeastern China and Lactobacillus perolens DSM 12745. Syst. Appl. Microbiol. 28, 688-694.	DSM 16991	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Schleiferilactobacillus*	*Schleiferilactobacillus perolens*		Dairy	Ongol, M.P. (2009). Main microorganisms involved in the fermentation of Ugandan ghee. Int J Food Microbiol. 133, 286-91. Henri-Dubernet, S. (2008). Diversity and dynamics of lactobacilli populations during ripening of RDO Camembert cheese. Can J Microbiol. 54, 218-228.	DSM 12744	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Schleiferilactobacillus*	*Schleiferilactobacillus perolens*		Plant Based	Miyamoto, M. (2005). Lactobacillus harbinensis sp. nov., consisted of strains isolated from traditional fermented vegetables 'Suan cai' in Harbin, Northeastern China and Lactobacillus perolens DSM 12745. Syst Appl Microbiol. 28, 688-94.	DSM 12744	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Secundilactobacillus*	*Secundilactobacillus collinoides*		Plant Based	Carr, J.G., Davies, P.A. (1972). The ecology and classification of strains of Lactobacillus collinoides nov. spec.: A bacterium commonly found in fermenting apple juice. Journal of Applied Bacteriology 35, 463-471.	ATCC 27612	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Secundilactobacillus*	*Secundilactobacillus malefermentans*		Alcoholic Beverages	Russell, C., Walker, T.K. (1953). Lactobacillus malefermentans n.sp., Isolated from Beer. J. gen. Microbiol. 8, 160-162.	ATCC 49373	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Secundilactobacillus*	*Secundilactobacillus paracollinoides*		Alcoholic Beverages	Suzuki, K., Funahashi, W., Koyanagi, M., Yamashita, H. (2004). Lactobacillus paracollinoides sp. nov., isolated from brewery environments. Int. J. Syst. Evol. Microbiol., 54, 115-117.	DSM 15502	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107
Monera	*Firmicutes*	*Lactobacillaceae*	*Secundilactobacillus*	*Secundilactobacillus similis*		Plant Based	Kitahara, M., Sakamoto, M., Benno, Y. (2010). Lactobacillus similis sp. nov., isolated from fermented cane molasses. Int. J. Syst. Evol. Microbiol. 60, 187-190.	JCM 2765	Zheng et al. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae Int. J. Syst. Evol. Microbiol. 2020;70:2782–2858 DOI 10.1099/ijsem.0.004107

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella beninensis*		Plant Based	Padonou, S.W., Schillinger, U., Nielsen, D.S., Franz, C.M.A.P., Hansen, M., Hounhouigan, J.D., Nago, M.C., Jakobsen, M. (2010). Weissella beninensis sp. nov., a motile lactic acid bacterium from submerged cassava fermentations, and emended description of the genus Weissella. Int. J. Syst. Evol. Microbiol. 60, 2193-2198.	DSM 22752	Padonou, S.W., Schillinger, U., Nielsen, D.S., Franz, C.M.A.P., Hansen, M., Hounhouigan, J.D., Nago, M.C., Jakobsen, M. (2010). Weissella beninensis sp. nov., a motile lactic acid bacterium from submerged cassava fermentations, and emended description of the genus Weissella. Int. J. Syst. Evol. Microbiol. 60, 2193-2198.
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella cibaria*		Plant Based	Ankaiah, D., Mitra, S., Srivastava, D., Sivagnanavelmurugan, M., Ayyanna, R., Jha, N., Venkatesan, A. (2021). Probiotic characterization of bacterial strains from fermented South Indian tomato pickle and country chicken intestine having antioxidative and antiproliferative activities. J Appl Microbiol. 2021 Jan 6. doi: 10.1111/jam.14991. Epub ahead of print. PMID: 33404172.	LMG 17699 DSM 20196	Björkroth, K.J., Schillinger, U., Geisen, R., Weiss, N., Hoste, B., Holzapfel, W.H., Korkeala, H.J., Vandamme, P. (2002). Taxonomic study of Weissella confusa and description of Weissella cibaria sp. nov., detected in food and clinical samples. Int. J. Syst. Evol. Microbiol. 52, 141-148.
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella cibaria*		Bakery	Pontonio, E., Nionelli, L., Curiel, J.A., Sadeghi, A., Di Cagno, R., Gobbetti, M., Rizzello, C.G. (2015). Iranian wheat flours from rural and industrial mills: Exploitation of the chemical and technology features, and selection of autochthonous sourdough starters for making breads. Food Microbiol. 2015 May;47:99-110. doi: 10.1016/j.fm.2014.10.011. Epub 2014 Dec 9. PMID: 25583343. Bounaix, M.S., Robert, H., Gabriel, V., Morel, S., Remaud-Siméon, M., Gabriel, B., Fontagné-Faucher, C. (2010). Characterization of dextran-producing Weissella strains isolated from sourdoughs and evidence of constitutive dextransucrase expression. FEMS Microbiol Lett. 2010 Oct;311(1):18-26. doi: 10.1111/j.1574-6968.2010.02067.x. Epub 2010 Aug 16. PMID: 20722740.	LMG 17699 DSM 20196	Björkroth, K.J., Schillinger, U., Geisen, R., Weiss, N., Hoste, B., Holzapfel, W.H., Korkeala, H.J., Vandamme, P. (2002). Taxonomic study of Weissella confusa and description of Weissella cibaria sp. nov., detected in food and clinical samples. Int. J. Syst. Evol. Microbiol. 52, 141-148.
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella cibaria*		Dairy	Yu, J., Wang, W.H., Menghe, B.L.G., Jiri, M.T., Wang, H.M., Liu, W.J., Bao, Q.H., Lu, Q., Zhang, J.C., Wang, F., Xu, H.Y., Sun, T.S., Zhang, H.P. (2011). Diversity of lactic acid bacteria associated with traditional fermented dairy products in Mongolia. J Dairy Sci. 94: 3229-41.	LMG 17699 DSM 20196	Björkroth, K.J., Schillinger, U., Geisen, R., Weiss, N., Hoste, B., Holzapfel, W.H., Korkeala, H.J., Vandamme, P. (2002). Taxonomic study of Weissella confusa and description of Weissella cibaria sp. nov., detected in food and clinical samples. Int. J. Syst. Evol. Microbiol. 52, 141-148
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella cibaria*		Meat	Ngoc Phan, Y.T., Tang, M.T., Minh Tran, T.T., Nguyen, V.H., Nguyen, T.H., Tsuruta, T., Nishino, N. (2017). Diversity of lactic acid bacteria in vegetable-based and meat-based fermented foods produced in the central region of Vietnam. AIMS Microbiol. 3: 61-70.	LMG 17699 DSM 20196	Björkroth, K.J., Schillinger, U., Geisen, R., Weiss, N., Hoste, B., Holzapfel, W.H., Korkeala, H.J., Vandamme, P. (2002). Taxonomic study of Weissella confusa and description of Weissella cibaria sp. nov., detected in food and clinical samples. Int. J. Syst. Evol. Microbiol. 52, 141-148
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella cibaria*		Seafood	Kopermsub, P., Yunchalard, S. (2010). Identification of lactic acid bacteria associated with the production of plaa-som, a traditional fermented fish product of Thailand. Int J Food Microbiol. 138: 200-4.	LMG 17699 DSM 20196	Björkroth, K.J., Schillinger, U., Geisen, R., Weiss, N., Hoste, B., Holzapfel, W.H., Korkeala, H.J., Vandamme, P. (2002). Taxonomic study of Weissella confusa and description of Weissella cibaria sp. nov., detected in food and clinical samples. Int. J. Syst. Evol. Microbiol. 52, 141-148
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella cibaria*		Plant Based	Rizzello, C.G., Coda, R., Wang, Y., Verni, M., Ilkka, K., Katina, K., Laitila, A. (2019). Characterization of indigenous Pediococcus pentosaceus, Leuconostoc kimchii, Weissella cibaria and Weissella confusa for faba bean bioprocessing. Int J Food Microbiol. 302: 24-34.	LMG 17699 DSM 20196	Björkroth, K.J., Schillinger, U., Geisen, R., Weiss, N., Hoste, B., Holzapfel, W.H., Korkeala, H.J., Vandamme, P. (2002). Taxonomic study of Weissella confusa and description of Weissella cibaria sp. nov., detected in food and clinical samples. Int. J. Syst. Evol. Microbiol. 52, 141-148
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella cibaria*		Plant Based	Di Cagno, R., Minervini, G., Rizzello, C.G., De Angelis, M., Gobbetti, M. (2011). Effect of lactic acid fermentation on antioxidant, texture, color and sensory properties of red and green smoothies. Food Microbiol. 28: 1062-71.	LMG 17699 DSM 20196	Björkroth, K.J., Schillinger, U., Geisen, R., Weiss, N., Hoste, B., Holzapfel, W.H., Korkeala, H.J., Vandamme, P. (2002). Taxonomic study of Weissella confusa and description of Weissella cibaria sp. nov., detected in food and clinical samples. Int. J. Syst. Evol. Microbiol. 52, 141-148

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella confusa*		Bakery	Katina, K. (2009). In situ production and analysis of Weissella confusa dextran in wheat sourdough. Food Microbiol. 26(7):734-43	ATCC 10881	Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S. (1993). Taxonomic studies on some Leuconostoc-like organisms from fermented sausages: description of a new genus Weissella for the Leuconostoc paramesenteroides group of species. J. Appl. Bacteriol. 75, 595-603. https://www.dsmz.de/catalogues/details/culture/DSM-20196.html
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella confusa*		Seafood	Rodpai, R., Sanpool, O., Thanchomnang, T., Wangwiwatsin, A., Sadaow, L., Phupiewkham, W., Boonroumkaew, P., Intapan, P.M., Maleewong, W. (2021). Investigating the microbiota of fermented fish products (Pla-ra) from different communities of northeastern Thailand. PLoS One. 2021 Jan 14;16(1):e0245227. doi: 10.1371/journal.pone.0245227. PMID: 33444386; PMCID: PMC7808594.	ATCC 10881	Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S. (1993). Taxonomic studies on some Leuconostoc-like organisms from fermented sausages: description of a new genus Weissella for the Leuconostoc paramesenteroides group of species. J. Appl. Bacteriol. 75, 595-603. https://www.dsmz.de/catalogues/details/culture/DSM-20196.html
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella confusa*		Alcoholic Beverages	Pardo, I. and Zuniga, M. (1992). Lactic Acid Bacteria in Spanish Red Rose and White Musts and Wines, JOURNAL OF FOOD SCIENCE, Vol. 57, No. 2, p. 392-396	ATCC 10881	Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S. (1993). Taxonomic studies on some Leuconostoc-like organisms from fermented sausages: description of a new genus Weissella for the Leuconostoc paramesenteroides group of species. J. Appl. Bacteriol. 75, 595-603. https://www.dsmz.de/catalogues/details/culture/DSM-20196.html
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella confusa*		Dairy	Li, J., Huang, Q., Zheng, X., Ge, Z., Lin, K., Zhang, D., Chen, Y., Wang, B., Shi, X. (2020). Investigation of the Lactic Acid Bacteria in Kazak Cheese and Their Contributions to Cheese Fermentation. Front Microbiol. 11:228.	ATCC 10881	Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S. (1993). Taxonomic studies on some Leuconostoc-like organisms from fermented sausages: description of a new genus Weissella for the Leuconostoc paramesenteroides group of species. J. Appl. Bacteriol. 75, 595-603.
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella confusa*		Plant Based	Ouoba, L.I.I., Nyanga-Koumou, C.A.G., Parkouda, C., Sawadogo, H., Kobawila, S.C., Keleke, S., Diawara, B., Louembe, D., Sutherland, J.P. (2010). Genotypic diversity of lactic acid bacteria isolated from African traditional alkaline-fermented foods. J Appl Microbiol. 108: 2019-29.	ATCC 10881	Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S. (1993). Taxonomic studies on some Leuconostoc-like organisms from fermented sausages: description of a new genus Weissella for the Leuconostoc paramesenteroides group of species. J. Appl. Bacteriol. 75, 595-603.
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella confusa*		Plant Based	Mugula, J.K., Nnko, S.A.M., Narvhus, J.A., Sørhaug, T. (2003). Microbiological and fermentation characteristics of togwa, a Tanzanian fermented food. Int J Food Microbiol. 80: 187-99.	ATCC 10881	Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S. (1993). Taxonomic studies on some Leuconostoc-like organisms from fermented sausages: description of a new genus Weissella for the Leuconostoc paramesenteroides group of species. J. Appl. Bacteriol. 75, 595-603.
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella confusa*		Plant Based	Lee, J.-S., Heo, G.-Y., Lee, J.W., Oh, Y.-J., Park, J.A., Park, Y.-H., Pyun, Y.-R., Ahn, J.S. (2005). Analysis of kimchi microflora using denaturing gradient gel electrophoresis. Int J Food Microbiol. 102: 143-50.	ATCC 10881	Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S. (1993). Taxonomic studies on some Leuconostoc-like organisms from fermented sausages: description of a new genus Weissella for the Leuconostoc paramesenteroides group of species. J. Appl. Bacteriol. 75, 595-603.
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella fabaria*		Plant Based	De Bruyne, K., Camu, N., De Vuyst, L., Vandamme, P. (2010). Weissella fabaria sp. nov., from a Ghanaian cocoa fermentation. Int. J. Syst. Evol. Microbiol. 60, 1999-2005.	DSM 21416	De Bruyne, K., Camu, N., De Vuyst, L., Vandamme, P. (2010). Weissella fabaria sp. nov., from a Ghanaian cocoa fermentation. Int. J. Syst. Evol. Microbiol. 60, 1999-2005.
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella ghanensis*		Plant Based	De Bruyne, K., Camu, N., Lefebvre, K., De Vuyst, L., Vandamme, P. (2008). Weissella ghanensis sp. nov., isolated from a Ghanaian cocoa fermentation. Int. J. Syst. Evol. Microbiol. 58, 2721-2725.	LMG 24286 DSM 19935	De Bruyne, K., Camu, N., Lefebvre, K., De Vuyst, L., Vandamme, P. (2008). Weissella ghanensis sp. nov., isolated from a Ghanaian cocoa fermentation. Int. J. Syst. Evol. Microbiol. 58, 2721-2725.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella hellenica*		Meat	Hu, Y., Zhang, L., Liu, Q., Wang, Y., Chen, Q., Kong, B. (2020). The potential correlation between bacterial diversity and the characteristic volatile flavour of traditional dry sausages from Northeast China. Food Microbiol. 2020 Oct;91:103505. doi: 10.1016/j.fm.2020.103505. Epub 2020 Apr 12. PMID: 32539975. Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S. (1993). Taxonomic studies on some Leuconostoc-like organisms from fermented sausages: description of a new genus Weissella for the Leuconostoc paramesenteroides group of species. J. Appl. Bacteriol. 75, 595-603.	DSM 7378	Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S. (1993). Taxonomic studies on some Leuconostoc-like organisms from fermented sausages: description of a new genus Weissella for the Leuconostoc paramesenteroides group of species. J. Appl. Bacteriol. 75, 595-603.
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella hellenica*		Plant Based	Kim, M.J., Seo, H.N., Hwang, T.S., Lee, S.H., Park, D.H. (2008). Characterization of exopolysaccharide (EPS) produced by Weissella hellenica SKkimchi3 isolated from kimchi. J Microbiol. 2008 Oct;46(5):535-41. doi: 10.1007/s12275-008-0134-y. Epub 2008 Oct 31. PMID: 18974955. Chen, Y.S., Wu, H.C., Lo, H.Y., Lin, W.C., Hsu, W.H., Lin, C.W., Lin, P.Y., Yanagida, F. (2012). Isolation and characterisation of lactic acid bacteria from jiang-gua (fermented cucumbers), a traditional fermented food in Taiwan. J Sci Food Agric. 2012 Aug 15;92(10):2069-75. doi: 10.1002/jsfa.5583. Epub 2012 Jan 23. PMID: 22271629.	DSM 7378	Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S. (1993). Taxonomic studies on some Leuconostoc-like organisms from fermented sausages: description of a new genus Weissella for the Leuconostoc paramesenteroides group of species. J. Appl. Bacteriol. 75, 595-603.
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella hellenica*		Dairy	Morea, M., Baruzzi, F., Cappa, F., Cocconcelli, P.S. (1998). Molecular characterization of the Lactobacillus community in traditional processing of Mozzarella cheese. Int J Food Microbiol. 43: 53-60.	DSM 7378	Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S. (1993). Taxonomic studies on some Leuconostoc-like organisms from fermented sausages: description of a new genus Weissella for the Leuconostoc paramesenteroides group of species. J. Appl. Bacteriol. 75, 595-603
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella koreensis*		Plant Based	Lee, J.S., Lee, K.C., Ahn, J.S., Mheen, T.I., Pyun, Y.R., Park, Y.H. (2002). Weissella koreensis sp. nov., isolated from kimchi. Int. J. Syst. Evol. Microbiol. 52, 1257-1261.	KCTC 3621 DSM 15830	Lee, J.S., Lee, K.C., Ahn, J.S., Mheen, T.I., Pyun, Y.R., Park, Y.H. (2002). Weissella koreensis sp. nov., isolated from kimchi. Int. J. Syst. Evol. Microbiol. 52, 1257-1261.
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella koreensis*		Bakery	Michel, E., Monfort, C., Deffrasnes, M., Guezenec, S., Lhomme, E., Barret, M., Sicard, D., Dousset, X., Onno, B. (2016) Characterization of relative abundance of lactic acid bacteria species in French organic sourdough by cultural, qPCR and MiSeq high-throughput sequencing methods. Int J Food Microbiol. 2016 Dec 19;239:35-43. doi: 10.1016/j.ijfoodmicro.2016.07.034. Epub 2016 Jul 29. PMID: 27539249.	KCTC 3621 DSM 15830	Lee, J.S., Lee, K.C., Ahn, J.S., Mheen, T.I., Pyun, Y.R., Park, Y.H. (2002). Weissella koreensis sp. nov., isolated from kimchi. Int. J. Syst. Evol. Microbiol. 52, 1257-1261.
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella koreensis*		Seafood	Song, E.J., Lee, E.S., Park, S.L., Choi, H.J., Roh, S.W., Nam, Y.D. (2018). Bacterial community analysis in three types of the fermented seafood, jeotgal, produced in South Korea. Biosci Biotechnol Biochem. 2018 Aug;82(8):1444-1454. doi: 10.1080/09168451.2018.1469395. Epub 2018 May 9. PMID: 29742980.	KCTC 3621 DSM 15830	Lee, J.S., Lee, K.C., Ahn, J.S., Mheen, T.I., Pyun, Y.R., Park, Y.H. (2002). Weissella koreensis sp. nov., isolated from kimchi. Int. J. Syst. Evol. Microbiol. 52, 1257-1261.
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella paramesenteroides*		Alcoholic Beverages	Huang, Z.R., Guo, W.L., Zhou, W.B., Li, L., Xu, J.X., Hong, J.L., Liu, H.P., Zeng, F., Bai, W.D., Liu, B., Ni, L., Rao, P.F., Lv XC. (2018). Microbial communities and volatile metabolites in different traditional fermentation starters used for Hong Qu glutinous rice wine. Food Res Int. 2019 Jul;121:593-603. doi: 10.1016/j.foodres.2018.12.024. Epub 2018 Dec 21. PMID: 31108786. Pardo, I. and Zuniga, M. (1992). Lactic Acid Bacteria in Spanish Red Rose and White Musts and Wines, Journal of Food Science, Vol. 57, No. 2, p. 392-395	ATCC 33313	Fusco, V., Quero, G.M., Cho, G.S., Kabisch, J., Meske, D., Neve, H., Bockelmann, W., Franz, C.M. (2015). The genus Weissella: taxonomy, ecology and biotechnological potential. Front Microbiol. 2015 Mar 17;6:155. doi: 10.3389/fmicb.2015.00155. PMID: 25852652; PMCID: PMC4362408.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella paramesenteroides*		Dairy	Shobharani, P., Agrawal, R. (2011). A potent probiotic strain from cheddar cheese. Indian J Microbiol. 2011 Jul;51(3):251-8. doi: 10.1007/s12088-011-0072-y. Epub 2011 Jan 29. PMID: 22753999; PMCID: PMC3209920.	ATCC 33313	Fusco, V., Quero, G.M., Cho, G.S., Kabisch, J., Meske, D., Neve, H., Bockelmann, W., Franz, C.M. (2015). The genus Weissella: taxonomy, ecology and biotechnological potential. Front Microbiol. 2015 Mar 17;6:155. doi: 10.3389/fmicb.2015.00155. PMID: 25852652; PMCID: PMC4362408.
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella paramesenteroides*		Alcoholic Beverages	Hancioğlu, O., Karapinar, M. (1997). Microflora of Boza, a traditional fermented Turkish beverage. Int J Food Microbiol. 1997 Apr 15;35(3):271-4. doi: 10.1016/s0168-1605(96)01230-5. PMID: 9105937.	ATCC 33313	Fusco, V., Quero, G.M., Cho, G.S., Kabisch, J., Meske, D., Neve, H., Bockelmann, W., Franz, C.M. (2015). The genus Weissella: taxonomy, ecology and biotechnological potential. Front Microbiol. 2015 Mar 17;6:155. doi: 10.3389/fmicb.2015.00155. PMID: 25852652; PMCID: PMC4362408.
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella paramesenteroides*		Meat	Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S. (1993). Taxonomic studies on some Leuconostoc-like organisms from fermented sausages: description of a new genus Weissella for the Leuconostoc paramesenteroides group of species. J. Appl. Bacteriol. 75, 595-603.	ATCC 33313 DSM 20288	Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S. (1993). Taxonomic studies on some Leuconostoc-like organisms from fermented sausages: description of a new genus Weissella for the Leuconostoc paramesenteroides group of species. J. Appl. Bacteriol. 75, 595-603.
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella paramesenteroides*		Plant Based	Satish Kumar, R., Ragu Varman, D., Kanmani, P., Yuvaraj, N., Paari, K.A., Pattukumar, V., Arul, V. (2010). Isolation, Characterization and Identification of a Potential Probiont from South Indian Fermented Foods (Kallappam, Koozh and Mor Kuzhambu) and Its Use as Biopreservative. Probiotics Antimicrob Proteins. 2010 Oct;2(3):145-51. doi: 10.1007/s12602-010-9052-5. PMID: 26781237.	ATCC 33313 DSM 20288	Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S. (1993). Taxonomic studies on some Leuconostoc-like organisms from fermented sausages: description of a new genus Weissella for the Leuconostoc paramesenteroides group of species. J. Appl. Bacteriol. 75, 595-603.
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella paramesenteroides*		Plant Based	Bortolini, C., Patrone, V., Puglisi, E., Morelli, L. (2016). Detailed analyses of the bacterial populations in processed cocoa beans of different geographic origin, subject to varied fermentation conditions. Int J Food Microbiol. 2016 Nov 7;236:98-106. doi: 10.1016/j.ijfoodmicro.2016.07.004. Epub 2016 Jul 8. PMID: 27458718.	ATCC 33313 DSM 20288	Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S. (1993). Taxonomic studies on some Leuconostoc-like organisms from fermented sausages: description of a new genus Weissella for the Leuconostoc paramesenteroides group of species. J. Appl. Bacteriol. 75, 595-603.
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella thailandensis*		Seafood	Lee, S.H., Ku, H.J., Ahn, M.J., Hong, J.S., Lee, S.H., Shin, H., Lee, K.C., Lee, J.S., Ryu, S., Jeon, C.O., Lee, J.H. (2015). Weissella jogaejeotgali sp. nov., isolated from jogae jeotgal, a traditional Korean fermented seafood. Int J Syst Evol Microbiol. 2015 Dec;65(12):4674-4681. doi: 10.1099/ijsem.0.000631. Epub 2015 Sep 24. PMID: 26410078. Tanasupawat, S., Shida, O., Okada, S., Komagata, K. (2000). Lactobacillus acidipiscis sp. nov. and Weissella thailandensis sp. nov., isolated from fermented fish in Thailand. International Journal of Systematic and Evolutionary Microbiology 50, 1479-85.	JCM 10695 DSM 15832	Kwak, M.J., Choi, S.B., Kim, B.Y., Chun, J. (2019). Genome-based reclassification of Weissella jogaejeotgali as a later heterotypic synonym of Weissella thailandensis. Int J Syst Evol Microbiol 2019; 69:3672-3675. Oren A, Garrity GM. Notification list. Notification that new names and new combinations have appeared in volume 69, part 12 of the IJSEM. Int J Syst Evol Microbiol 2020; 70:1447-1449.
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella thailandensis*		Dairy	Li, Y.Q., Tian, W.L., Gu, C.T. (2020). Weissella sagaensis sp. nov., isolated from traditional Chinese yogurt. Int J Syst Evol Microbiol. 2020 Apr;70(4):2485-2492. doi: 10.1099/ijsem.0.004062. Epub 2020 Feb 25. PMID: 32100692. Morales, F., Morales, J.I., Hernández, C.H., Hernández-Sánchez, H. (2011). Isolation and partial characterization of halotolerant lactic acid bacteria from two Mexican cheeses. Appl Biochem Biotechnol. 2011 Jul;164(6):889-905. doi: 10.1007/s12010-011-9182-6. Epub 2011 Feb 16. PMID: 21327742.	JCM 10695 DSM 15832	Kwak, M.J., Choi, S.B., Kim, B.Y., Chun, J. (2019). Genome-based reclassification of Weissella jogaejeotgali as a later heterotypic synonym of Weissella thailandensis. Int J Syst Evol Microbiol 2019; 69:3672-3675. Oren A, Garrity GM. Notification list. Notification that new names and new combinations have appeared in volume 69, part 12 of the IJSEM. Int J Syst Evol Microbiol 2020; 70:1447-1449.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Lactobacillaceae*	*Weissella*	*Weissella thailandensis*		Meat	Juárez-Castelán, C., García-Cano, I., Escobar-Zepeda, A., Azaola-Espinosa, A., Álvarez-Cisneros, Y., Ponce-Alquicira, E. (2019). Evaluation of the bacterial diversity of Spanish-type chorizo during the ripening process using high-throughput sequencing and physicochemical characterization. Meat Sci. 150: 7-13.	JCM 10695 - DSM 15832	Kwak, M.J., Choi, S.B., Kim, B.Y., Chun, J. (2019) Genome-based reclassification of Weissella jogaejeotgali as a later heterotypic synonym of Weissella thailandensis. Int J Syst Evol Microbiol 2019; 69:3672-3675. Oren A, Garrity GM. Notification list. Notification that new names and new combinations have appeared in volume 69, part 12 of the IJSEM. Int J Syst Evol Microbiol 2020; 70:1447-1449.
Monera	*Firmicutes*	*Staphylococcaceae*	*Macrococcus*	*Macrococcus caseolyticus*		Meat	Bhutia, M.O., Thapa, N., Tamang, J.P. (2021). Molecular Characterization of Bacteria, Detection of Enterotoxin Genes, and Screening of Antibiotic Susceptibility Patterns in Traditionally Processed Meat Products of Sikkim, India. Front Microbiol. 2021 Jan 11;11:599606. doi: 10.3389/fmicb.2020.599606. PMID: 33505372; PMCID: PMC7830132. Catalase-positive cocci in fermented sausage: Variability due to different pork breeds, breeding systems and sausage production technology. Food Microbiol. 2012 Apr;29(2):178-86. doi: 10.1016/j.fm.2011.09.005. Epub 2011 Sep 22. PMID: 22202871.	ATCC 13548 DSM 20597	Kloos, W.E., Ballard, D.N., George, C.G., Webster, J.A., Hubner, R.J., Ludwig, W., Schleifer, K.H., Fiedler, F., Schubert, K. (1998). Delimiting the genus Staphylococcus through description of Macrococcus caseolyticus gen. nov., comb. nov. and Macrococcus equipercicus sp. nov., Macrococcus bovicus sp. nov. and Macrococcus carouselicus sp. nov. Int. J. Syst. Bacteriol. 48, 859-877.
Monera	*Firmicutes*	*Staphylococcaceae*	*Macrococcus*	*Macrococcus caseolyticus*		Dairy	Martins, M.C.F., Freitas, R., Deuvaux, J.C., Eller, M.R., Nero, L.A., Carvalho, A.F. (2018). Bacterial diversity of artisanal cheese from the Amazonian region of Brazil during the dry and rainy seasons. Food Res Int. 2018 Jun;108:295-300. doi: 10.1016/j.foodres.2018.03.060. Epub 2018 Mar 22. PMID: 29735061. Bhowmik, T., Marth, E.H. (1990). Role of Micrococcus and Pediococcus species in cheese ripening. J. Dairy Sci 73, 859-866.	ATCC 13548 DSM 20597	Kloos, W.E., Ballard, D.N., George, C.G., Webster, J.A., Hubner, R.J., Ludwig, W., Schleifer, K.H., Fiedler, F., Schubert, K. (1998). Delimiting the genus Staphylococcus through description of Macrococcus caseolyticus gen. nov., comb. nov. and Macrococcus equipercicus sp. nov., Macrococcus bovicus sp. nov. and Macrococcus carouselicus sp. nov. Int. J. Syst. Bacteriol. 48, 859-877.
Monera	*Firmicutes*	*Staphylococcaceae*	*Macrococcus*	*Macrococcus caseolyticus*		Seafood	Dai, Z., Li, Y., Wu, J., Zhao, Q. (2013). Diversity of lactic acid bacteria during fermentation of a traditional Chinese fish product, Chouguiyu (stinky mandarinfish). J Food Sci. 2013 Nov;78(11):M1778-83. doi: 10.1111/1750-3841.12289. PMID: 24245896.	ATCC 13548 DSM 20597	Kloos, W.E., Ballard, D.N., George, C.G., Webster, J.A., Hubner, R.J., Ludwig, W., Schleifer, K.H., Fiedler, F., Schubert, K. (1998). Delimiting the genus Staphylococcus through description of Macrococcus caseolyticus gen. nov., comb. nov. and Macrococcus equipercicus sp. nov., Macrococcus bovicus sp. nov. and Macrococcus carouselicus sp. nov. Int. J. Syst. Bacteriol. 48, 859-877.
Monera	*Firmicutes*	*Staphylococcaceae*	*Mammaliicoccus*	*Mammaliicoccus fleurettii*		Dairy	Vernozy-Rozand, C., Mazuy-Cruchaudet, C., Meugnier, H., Bes, M., Lasne, Y., Fiedler, F., Etienne, J., Freney, J. (2000). Staphylococcus fleurettii sp. nov., isolated from goat's milk cheeses. Int. J. Syst. Evol. Microbiol. 50, 1521-1527.	CIP 106114 DSM 13212	Madhaiyan, M., Wirth, J.S., Saravanan, V.S. (2020). Phylogenomic analyses of the Staphylococcaceae family suggest the reclassification of five species within the genus Staphylococcus as heterotypic synonyms, the promotion of five subspecies to novel species, the taxonomic reassignment of five Staphylococcus species to Mammaliicoccus gen. nov., and the formal assignment of Nosocomiicoccus to the family Staphylococcaceae. Int J Syst Evol Microbiol. 2020 Nov;70(11):5926-5936. doi: 10.1099/ijsem.0.004498. PMID: 33052802.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Staphylococcaceae*	*Mammaliicoccus*	*Mammaliicoccus sciuri*		Dairy	Ruaro, A., Andrighetto, C., Torriani, S., Lombardi, A. (2012). Biodiversity and characterization of indigenous coagulase-negative staphylococci isolated from raw milk and cheese of North Italy. Food Microbiol. 2013 May;34(1):106-11. doi: 10.1016/j.fm.2012.11.013. Epub 2012 Dec 4. PMID: 23498185. O'Halloran, R. (1998). Purification of an extracellular proteinase from Staphylococcus sciuri found on the surface of Tilsit cheese. Biochem Soc Trans. 26, S29.	ATCC 29062 DSM 20345	Cogan, T.M., Goerges, S., Gelsomino, R., Larpin, S., Hohenegger, M., Bora, N., Jamet, E., Rea, M.C., Mounier, J., Vancanneyt, M., Guéguen, M., Desmasures, N., Swings, J., Goodfellow, M., Ward, A.C., Sebastiani, H., Irlinger, F., Chamba, J.F., Beduhn, R., Scherer, S. (2014). Biodiversity of the Surface Microbial Consortia from Limburger, Reblochon, Livarot, Tilsit, and Gubbeen Cheeses. Microbiol Spectr. 2014 Feb;2(1):CM-0010-2012. doi: 10.1128/microbiolspec.CM-0010-2012. PMID: 26082119.
Monera	*Firmicutes*	*Staphylococcaceae*	*Mammaliicoccus*	*Mammaliicoccus vitulinus*		Dairy	Bannerman, J.A., Hubner, R.J., Ballard, D.N., Cole, E.M., Bruce, J.L., Fiedler, F., Schubert, K., Kloos, W.E. (1994). Identification of the Staphylococcus sciuri species group with EcoRI fragments containing rRNA sequences and description of Staphylococcus vitulus sp. nov. Int. J. Syst. Bacteriol. 44, 454-460.	ATCC 51145 DSM 15615	Madhaiyan, M., Wirth, J.S., Saravanan, V.S. (2020). Phylogenomic analyses of the Staphylococcaceae family suggest the reclassification of five species within the genus Staphylococcus as heterotypic synonyms, the promotion of five subspecies to novel species, the taxonomic reassignment of five Staphylococcus species to Mammaliicoccus gen. nov., and the formal assignment of Nosocomiicoccus to the family Staphylococcaceae. Int J Syst Evol Microbiol. 2020 Nov;70(11):5926-5936. doi: 10.1099/ijsem.0.004498. PMID: 33052802.
Monera	*Firmicutes*	*Staphylococcaceae*	*Mammaliicoccus*	*Mammaliicoccus vitulinus*		Meat	Palavecino Prpich, N.Z., Garro, O.A., Romero, M., Judis, M.A., Cayré, M.E., Castro, M.P. (2016). Evaluation of an autochthonous starter culture on the production of a traditional dry fermented sausage from Chaco (Argentina) at a small-scale facility. Meat Sci. 2016 May;115:41-4. doi: 10.1016/j.meatsci.2016.01.005. Epub 2016 Jan 19. PMID: 26820805. Bannerman, J.A., Hubner, R.J., Ballard, D.N., Cole, E.M., Bruce, J.L., Fiedler, F., Schubert, K., Kloos, W.E. (1994). Identification of the Staphylococcus sciuri species group with EcoRI fragments containing rRNA sequences and description of Staphylococcus vitulus sp. nov. Int. J. Syst. Bacteriol. 44, 454-460.	ATCC 51145 DSM 15615	Madhaiyan, M., Wirth, J.S., Saravanan, V.S. (2020). Phylogenomic analyses of the Staphylococcaceae family suggest the reclassification of five species within the genus Staphylococcus as heterotypic synonyms, the promotion of five subspecies to novel species, the taxonomic reassignment of five Staphylococcus species to Mammaliicoccus gen. nov., and the formal assignment of Nosocomiicoccus to the family Staphylococcaceae. Int J Syst Evol Microbiol. 2020 Nov;70(11):5926-5936. doi: 10.1099/ijsem.0.004498. PMID: 33052802.
Monera	*Firmicutes*	*Staphylococcaceae*	*Mammaliicoccus*	*Mammaliicoccus vitulinus*		Plant Based	Nam, Y.-D., Chung, W.-H. and Lim, S.-I. (2012). Draft genome sequence of Staphylococcus vitulinus F1028, a strain isolated from a block of fermented soybean. J. Bacteriol., 194, 5961-5962.	ATCC 51145 DSM 15615	Madhaiyan, M., Wirth, J.S., Saravanan, V.S. (2020). Phylogenomic analyses of the Staphylococcaceae family suggest the reclassification of five species within the genus Staphylococcus as heterotypic synonyms, the promotion of five subspecies to novel species, the taxonomic reassignment of five Staphylococcus species to Mammaliicoccus gen. nov., and the formal assignment of Nosocomiicoccus to the family Staphylococcaceae. Int J Syst Evol Microbiol. 2020 Nov;70(11):5926-5936. doi: 10.1099/ijsem.0.004498. PMID: 33052802.

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Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus carnosus*		Dairy	Morea, M., Baruzzi, F., Cocconcelli, P.S. (1999). Molecular and physiological characterization of dominant bacterial populations in traditional mozzarella cheese processing. J Appl Microbiol. 1999 Oct;87(4):574-82. doi: 10.1046/j.1365-2672.1999.00855.x. PMID: 10583686.	ATCC 51365	Madhaiyan, M., Wirth, J.S., Saravanan, V.S. (2020). Phylogenomic analyses of the Staphylococcaceae family suggest the reclassification of five species within the genus Staphylococcus as heterotypic synonyms, the promotion of five subspecies to novel species, the taxonomic reassignment of five Staphylococcus species to Mammaliicoccus gen. nov., and the formal assignment of Nosocomiicoccus to the family Staphylococcaceae. Int J Syst Evol Microbiol. 2020 Nov;70(11):5926-5936. doi: 10.1099/ijsem.0.004498. PMID: 33052802.
Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus carnosus*		Plant Based	Feng, Z., Gao, W., Ren, D., Chen, X., Li, J.J. (2013). Evaluation of bacterial flora during the ripening of Kedong sufu, a typical Chinese traditional bacteria-fermented soybean product. J Sci Food Agric. 2013 Apr;93(6):1471-8. doi: 10.1002/jsfa.5918. Epub 2013 Feb 11. PMID: 23400969.	ATCC 51365	Madhaiyan, M., Wirth, J.S., Saravanan, V.S. (2020). Phylogenomic analyses of the Staphylococcaceae family suggest the reclassification of five species within the genus Staphylococcus as heterotypic synonyms, the promotion of five subspecies to novel species, the taxonomic reassignment of five Staphylococcus species to Mammaliicoccus gen. nov., and the formal assignment of Nosocomiicoccus to the family Staphylococcaceae. Int J Syst Evol Microbiol. 2020 Nov;70(11):5926-5936. doi: 10.1099/ijsem.0.004498. PMID: 33052802.
Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus carnosus*		Seafood	Devi, K.R., Deka, M., Jeyaram, K. (2015). Bacterial dynamics during yearlong spontaneous fermentation for production of ngari, a dry fermented fish product of Northeast India. Int J Food Microbiol. 2015 Apr 16;199:62-71. doi: 10.1016/j.ijfoodmicro.2015.01.004. Epub 2015 Jan 10. PMID: 25637876.	ATCC 51365	Madhaiyan, M., Wirth, J.S., Saravanan, V.S. (2020). Phylogenomic analyses of the Staphylococcaceae family suggest the reclassification of five species within the genus Staphylococcus as heterotypic synonyms, the promotion of five subspecies to novel species, the taxonomic reassignment of five Staphylococcus species to Mammaliicoccus gen. nov., and the formal assignment of Nosocomiicoccus to the family Staphylococcaceae. Int J Syst Evol Microbiol. 2020 Nov;70(11):5926-5936. doi: 10.1099/ijsem.0.004498. PMID: 33052802.
Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus carnosus*		Meat	Löfblom, J., Rosenstein, R., Nguyen, M.T., Ståhl, S., Götz, F. (2017). Staphylococcus carnosus: from starter culture to protein engineering platform. Appl Microbiol Biotechnol. 2017 Dec;101(23-24):8293-8307. doi: 10.1007/s00253-017-8528-6. Epub 2017 Oct 2. PMID: 28971248; PMCID: PMC5694512	ATCC 51365	Madhaiyan, M., Wirth, J.S., Saravanan, V.S. (2020). Phylogenomic analyses of the Staphylococcaceae family suggest the reclassification of five species within the genus Staphylococcus as heterotypic synonyms, the promotion of five subspecies to novel species, the taxonomic reassignment of five Staphylococcus species to Mammaliicoccus gen. nov., and the formal assignment of Nosocomiicoccus to the family Staphylococcaceae. Int J Syst Evol Microbiol. 2020 Nov;70(11):5926-5936. doi: 10.1099/ijsem.0.004498. PMID: 33052802.

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Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus cohnii*		Dairy	Deetae, P. (2007). Production of volatile aroma compounds by bacterial strains isolated from different surface-ripened French cheeses. Appl Microbiol Biotechnol. 76(5):1161-71.	ATCC 29974 DSM 20260	Madhaiyan, M., Wirth, J.S., Saravanan, V.S. (2020). Phylogenomic analyses of the Staphylococcaceae family suggest the reclassification of five species within the genus Staphylococcus as heterotypic synonyms, the promotion of five subspecies to novel species, the taxonomic reassignment of five Staphylococcus species to Mammaliicoccus gen. nov., and the formal assignment of Nosocomiicoccus to the family Staphylococcaceae. Int J Syst Evol Microbiol. 2020 Nov;70(11):5926-5936. doi: 10.1099/ijsem.0.004498. PMID: 33052802. Lavecchia, A., Chiara, M., De Virgilio, C., Manzari, C., Pazzani, C., Horner, D., Pesole, G., Placido, A. (2021). Comparative genomics suggests a taxonomic revision of the Staphylococcus cohnii species complex. Genome Biol Evol. 2021 Feb 12:evab020. doi: 10.1093/gbe/evab020. Epub ahead of print. PMID: 33576800.
Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus cohnii*		Meat	Drosinos, E.H. (2007). Phenotypic and technological diversity of lactic acid bacteria and staphylococci isolated from traditionally fermented sausages in southern Greece. Food Microbiol. 24(3):260-70.	ATCC 29974 DSM 20260	Madhaiyan, M., Wirth, J.S., Saravanan, V.S. (2020). Phylogenomic analyses of the Staphylococcaceae family suggest the reclassification of five species within the genus Staphylococcus as heterotypic synonyms, the promotion of five subspecies to novel species, the taxonomic reassignment of five Staphylococcus species to Mammaliicoccus gen. nov., and the formal assignment of Nosocomiicoccus to the family Staphylococcaceae. Int J Syst Evol Microbiol. 2020 Nov;70(11):5926-5936. doi: 10.1099/ijsem.0.004498. PMID: 33052802. Lavecchia, A., Chiara, M., De Virgilio, C., Manzari, C., Pazzani, C., Horner, D., Pesole, G., Placido, A. (2021). Comparative genomics suggests a taxonomic revision of the Staphylococcus cohnii species complex. Genome Biol Evol. 2021 Feb 12:evab020. doi: 10.1093/gbe/evab020. Epub ahead of print. PMID: 33576800.
Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus cohnii*		Seafood	Devi, K.R., Deka, M., Jeyaram, K. (2015). Bacterial dynamics during yearlong spontaneous fermentation for production of ngari, a dry fermented fish product of Northeast India. Int J Food Microbiol. Apr 16;199:62-71. doi: 10.1016/j.ijfoodmicro.2015.01.004. Epub 2015 Jan 10. PMID: 25637876.	ATCC 29974 DSM 20260	Madhaiyan, M., Wirth, J.S., Saravanan, V.S. (2020). Phylogenomic analyses of the Staphylococcaceae family suggest the reclassification of five species within the genus Staphylococcus as heterotypic synonyms, the promotion of five subspecies to novel species, the taxonomic reassignment of five Staphylococcus species to Mammaliicoccus gen. nov., and the formal assignment of Nosocomiicoccus to the family Staphylococcaceae. Int J Syst Evol Microbiol. 2020 Nov;70(11):5926-5936. doi: 10.1099/ijsem.0.004498. PMID: 33052802. Lavecchia, A., Chiara, M., De Virgilio, C., Manzari, C., Pazzani, C., Horner, D., Pesole, G., Placido, A. (2021). Comparative genomics suggests a taxonomic revision of the Staphylococcus cohnii species complex. Genome Biol Evol. 2021 Feb 12:evab020. doi: 10.1093/gbe/evab020. Epub ahead of print. PMID: 33576800.

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Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus condimenti*		Plant Based	Probst, A.J., Hertel, C., Richter, L., Wassill, L., Ludwig, W., Hammes, W.P. (1998). Staphylococcus condimenti sp. nov., from soy sauce mash, and Staphylococcus carnosus (Schleifer and Fischer 1982) subsp. utilis subsp. nov. Int. J. Syst. Bacteriol. 48, 651-658.	DSM 11674	Probst, A.J., Hertel, C., Richter, L., Wassill, L., Ludwig, W., Hammes, W.P. (1998). Staphylococcus condimenti sp. nov., from soy sauce mash, and Staphylococcus carnosus (Schleifer and Fischer 1982) subsp. utilis subsp. nov. Int. J. Syst. Bacteriol. 48, 651-658.
Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus condimenti*		Seafood	Majumdar, R.K., Gupta, S. (2020). Isolation, identification and characterization of Staphylococcus sp. from Indian ethnic fermented fish product. Lett Appl Microbiol. 2020 Oct;71(4):359-368. doi: 10.1111/lam.13362. Epub 2020 Aug 14. PMID: 32713031.	DSM 11674	Probst, A.J., Hertel, C., Richter, L., Wassill, L., Ludwig, W., Hammes, W.P. (1998). Staphylococcus condimenti sp. nov., from soy sauce mash, and Staphylococcus carnosus (Schleifer and Fischer 1982) subsp. utilis subsp. nov. Int. J. Syst. Bacteriol. 48, 651-658.
Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus equorum*	*Staphylococcus equorum* subsp. *equorum*	Dairy	Ercolini, D., Hill, P.J., Dodd, C.E. (2003). Bacterial community structure and location in Stilton cheese. Appl Environ Microbiol. 2003 Jun;69(6):3540-8. doi: 10.1128/aem.69.6.3540-3548.2003. PMID: 12788761; PMCID: PMC161494. Carnio, M., Höltzel, A., Rudolf, M., Henle, T., Jung, G., Scherer, S. (2000). The Macrocyclic Peptide Antibiotic Micrococcin P1 Is Secreted by the Food-Borne Bacterium Staphylococcus equorum WS 2733 and Inhibits Listeria monocytogenes on Soft Cheese. Appl Environ Microbiol. 66, 2378–2384.	DSM 20674 ATCC 43958	Jeong, D.W., Kim, H.R., Han, S., Jeon, C.O., Lee, J.H. (2013). A proposal to unify two subspecies of Staphylococcus equorum: Staphylococcus equorum subsp. equorum and Staphylococcus equorum subsp. linens. Antonie Van Leeuwenhoek. 2013 Dec;104(6):1049-62. doi: 10.1007/s10482-013-0025-z. Epub 2013 Sep 22. PMID: 24057981.
Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus equorum*	*Staphylococcus equorum* subsp. *equorum*	Meat	Landeta, G., Curiel, J.A., Carrascosa, A.V., Muñoz, R., de las Rivas, B. (2012). Characterization of coagulase-negative staphylococci isolated from Spanish dry cured meat products. Meat Sci. 2013 Mar;93(3):387-96. doi: 10.1016/j.meatsci.2012.09.019. Epub 2012 Oct 31. PMID: 23273441. Schlafmann, K., Meusburger, A.P., Hammes, W.P., Braun, C., Fischer, A., Hertel, C. (2002). Starterkulturen zur Verbesserung der Qualität von Rohschinken. Fleischwirtschaft 11, 108-114.	DSM 20674 ATCC 43958	Jeong, D.W., Kim, H.R., Han, S., Jeon, C.O., Lee, J.H. (2013). A proposal to unify two subspecies of Staphylococcus equorum: Staphylococcus equorum subsp. equorum and Staphylococcus equorum subsp. linens. Antonie Van Leeuwenhoek. 2013 Dec;104(6):1049-62. doi: 10.1007/s10482-013-0025-z. Epub 2013 Sep 22. PMID: 24057981.
Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus equorum*	*Staphylococcus equorum* subsp. *linens*	Dairy	Place, R.B., Hiestand, D., Gallmann, H.R., Teuber, M. (2003). Staphylococcus equorum subsp. linens, subsp. nov., a starter culture component for surface ripened semi-hard cheeses. Syst. Appl. Microbiol. 26, 30-37.	DSM 15097	Place, R.B., Hiestand, D., Gallmann, H.R., Teuber, M. (2003). Staphylococcus equorum subsp. linens, subsp. nov., a starter culture component for surface ripened semi-hard cheeses. Syst. Appl. Microbiol. 26, 30-37.
Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus piscifermentans*		Seafood	Majumdar, R.K., Gupta, S. (2020). Isolation, identification and characterization of Staphylococcus sp. from Indian ethnic fermented fish product. Lett Appl Microbiol. 2020 Oct;71(4):359-368. doi: 10.1111/lam.13362. Epub 2020 Aug 14. PMID: 32713031. Tanasupawat, S., Hashimoto, Y., Ezaki, T., Kozaki, M., Komagata, K. (1992). Staphylococcus piscifermentans sp. nov., from fermented fish in Thailand. Int. J. Syst. Bacteriol. 42, 577-581.	NRIC 1817 DSM 7373	Tanasupawat, S., Hashimoto, Y., Ezaki, T., Kozaki, M., Komagata, K. (1992). Staphylococcus piscifermentans sp. nov., from fermented fish in Thailand. Int. J. Syst. Bacteriol. 42, 577-581.
Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus saprophyticus*		Meat	Kaban, G.J. (2008). Identification of lactic acid bacteria and Gram-positive catalase-positive cocci isolated from naturally fermented sausage (sucuk). Food Sci. 73(8):M385-8.	ATCC 15305 DSM 20229	(Fairbrother, 1940) Shaw, C., Stitt, M., Cowan, S.T. (1951). Staphylococci and their classification. J. Gen. Microbiol. 5: 1010-1023.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus saprophyticus*		Dairy	Bertuzzi, A.S., Guinane, C.M., Crispie, F., Kilcawley, K.N., McSweeney, P.L.H., Rea, M.C. (2017). Genome Sequence of Staphylococcus saprophyticus DPC5671, a Strain Isolated from Cheddar Cheese. Genome Announc. 2017 Apr 20;5(16):e00193-17. doi: 10.1128/genomeA.00193-17. PMID: 28428298; PMCID: PMC5399257. Cogan, T.M., Goerges, S., Gelsomino, R., Larpin, S., Hohenegger, M., Bora, N., Jamet, E., Rea, M.C., Mounier, J., Vancanneyt, M., Guéguen, M., Desmasures, N., Swings, J., Goodfellow, M., Ward, A.C., Sebastiani, H., Irlinger, F., Chamba, J.F., Beduhn, R., Scherer, S. (2014). Biodiversity of the Surface Microbial Consortia from Limburger, Reblochon, Livarot, Tilsit, and Gubbeen Cheeses. Microbiol Spectr. 2014 Feb;2(1):CM-0010-2012. doi: 10.1128/microbiolspec.CM-0010-2012. PMID: 26082119.	ATCC 15305 DSM 20229	(Fairbrother, 1940) Shaw, C., Stitt, M., Cowan, S.T. (1951). Staphylococci and their classification. J. Gen. Microbiol. 5: 1010-1023.
Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus succinus*	*Staphylococcus succinus* subsp. *casei*	Dairy	Place, R.B., Hiestand, D., Burri, S., Teuber, M. (2002). Staphylococcus succinus subsp. casei subsp. nov., a dominant isolate from a surface ripened cheese. Systematic and Applied Microbiology 25, 353-9.	DSM 15096	Place, R.B., Hiestand, D., Burri, S., Teuber, M. (2002). Staphylococcus succinus subsp. casei subsp. nov., a dominant isolate from a surface ripened cheese. Systematic and Applied Microbiology 25, 353-9.
Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus succinus*	*Staphylococcus succinus* subsp. *succinus*	Meat	Talon, R., Leroy, S., Lebert, I., Giammarinaro, P., Chacornac, J.P., Latorre-Moratalla, M., Vidal-Carou, C., Zanardi, E., Conter, M., Lebecque, A. (2008). Safety improvement and preservation of typical sensory qualities of traditional dry fermented sausages using autochthonous starter cultures. International Journal of Food Microbiology 126, 227-34. Villani, F., Casaburi, A., Pennacchia, C., Filosa, L., Russo, F., Ercolini, D. (2008). Microbial ecology of the soppressata of Vallo di Diano, a traditional dry fermented sausage from southern Italy, and in vitro and in situ selection of autochthonous starter cultures. Applied and Environmental Microbiology 73, 5453-63.	ATCC 700337 DSM 14617	Lambert, L.H., Cox, T., Mitchell, K., Rosselló-Mora, R.A., Del Cueto, C., Dodge, D.E., Orkand, P., Cano, R.J. (1998). Staphylococcus succinus sp. nov., isolated from Dominican amber. Int J Syst Bacteriol. 48 Pt 2:511-8.
Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus warneri*		Meat	Corbière Morot-Bizot, S. (2006). Staphylococcal community of a small unit manufacturing traditional dry fermented sausages. Int J Food Microbiol. 108, 210-7.	ATCC 27836 DSM 20316	Kloos, W.E., Schleifer, K.H. (1975). Isolation and characterization of staphylococci from human skin. II. Description of four new species: Staphylococcus warneri, Staphylococcus capitis, Staphylococcus hominis, and Staphylococcus simulans. International Journal of Systematic Bacteriology 25, 62-79.
Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus xylosus*		Dairy	Ruaro, A., Andrighetto, C., Torriani, S., Lombardi, A. (2012). Biodiversity and characterization of indigenous coagulase-negative staphylococci isolated from raw milk and cheese of North Italy. Food Microbiol. 2013 May;34(1):106-11. doi: 10.1016/j.fm.2012.11.013. Epub 2012 Dec 4. PMID: 23498185.	ATCC 29971 DSM 20266	Schleifer, K.H., Kloos, W.E. (1975). Isolation and characterization of staphylococci from human skin. I. Amended descriptions of Staphylococcus epidermidis and Staphylococcus saprophyticus and descriptions of three new species: Staphylococcus cohnii, Staphylococcus haemolyticus, and Staphylococcus xylosus. International Journal of Systematic Bacteriology 25, 50-61.
Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus xylosus*		Meat	Corbière Morot-Bizot, S. (2006). Staphylococcal community of a small unit manufacturing traditional dry fermented sausages. Int J Food Microbiol. 108, 210-7.	ATCC 29971 DSM 20266	Schleifer, K.H., Kloos, W.E. (1975). Isolation and characterization of staphylococci from human skin. I. Amended descriptions of Staphylococcus epidermidis and Staphylococcus saprophyticus and descriptions of three new species: Staphylococcus cohnii, Staphylococcus haemolyticus, and Staphylococcus xylosus. International Journal of Systematic Bacteriology 25, 50-61.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Staphylococcaceae*	*Staphylococcus*	*Staphylococcus xylosus*		Plant Based	Jang, M., Jeong, D.-W. and Lee, J.-H. (2019). Identification of the predominant Bacillus, Enterococcus, and Staphylococcus species in Meju, a Spontaneously fermented soybean products. Microbiol. Biotechnol. Lett., 47, 359-363.	ATCC 29971 DSM 20266	Schleifer, K.H., Kloos, W.E. (1975). Isolation and characterization of staphylococci from human skin. I. Amended descriptions of Staphylococcus epidermidis and Staphylococcus saprophyticus and descriptions of three new species: Staphylococcus cohnii, Staphylococcus haemolyticus, and Staphylococcus xylosus. International Journal of Systematic Bacteriology 25, 50-61.
Monera	*Firmicutes*	*Streptococcaceae*	*Lactococcus*	*Lactococcus cremoris*		Dairy	Thomas, T.D., Turner, K.W., Crow, V.L. (1980). Galactose fermentation by Streptococcus lactis and Streptococcus cremoris: pathways, products, and regulation. J Bacteriol. 144, 672-82.	ATCC 19257	Li, T.T., Tian, W.L., Gu, C.T. (2019). Elevation of Lactococcus lactis subsp. cremoris to the species level as Lactococcus cremoris sp. nov. and transfer of Lactococcus lactis subsp. tructae to Lactococcus cremoris as Lactococcus cremoris subsp. tructae comb. nov. Int J Syst Evol Microbiol. 2019 Jun;71(3). doi: 10.1099/ijsem.0.004727. Epub 2021 Mar 2. PMID: 33650946.
Monera	*Firmicutes*	*Streptococcaceae*	*Lactococcus*	*Lactococcus hircilactis*		Dairy	Tidona, F., Meucci, A., Povolo, M., Pelizzola, V., Zago, M., Contarini, G., Carminati, D., Giraffa, G. (2018). Applicability of Lactococcus hircilactis and Lactococcus laudensis as dairy cultures. Int J Food Microbiol. 2018 Apr 20;271:1-7. doi: 10.1016/j.ijfoodmicro.2018.02.015.	DSM 28961	Meucci, A., Zago, M., Rossetti, L., Fornasari, M.E., Bonvini, B., Tidona, F., Povolo, M., Contarini, G., Carminati, D., Giraffa, G. (2015). Lactococcus hircilactis sp. nov. and Lactococcus laudensis sp. nov., isolated from milk. Int J Syst Evol Microbiol. 2015 Jul;65(7):2091-2096. doi: 10.1099/ijs.0.000225
Monera	*Firmicutes*	*Streptococcaceae*	*Lactococcus*	*Lactococcus lactis*	*Lactococcus lactis* subsp. *lactis*	Dairy	Thomas, T.D., Turner, K.W., Crow, V.L. (1980). Galactose fermentation by Streptococcus lactis and Streptococcus cremoris: pathways, products, and regulation. J Bacteriol. 144, 672-82.	ATCC 19435	Lister, J. (1873). A further contribution to the natural history of bacteria and the germ theory of fermentative changes. Quart. Microbiol. Sci. 13, 380–408.
Monera	*Firmicutes*	*Streptococcaceae*	*Lactococcus*	*Lactococcus lactis*	*Lactococcus lactis* subsp. *lactis*	Meat	Rodriguez, J.M., Cintas, L.M., Casaus, P., Horn, N., Dodd, H.M., Hernandez, P.E., Gasson, M.J. (1995). Isolation of nisin-producing Lactococcus lactis strains from dry fermented sausages. J Applied Bacteriology 79 p109-115	ATCC 19435	Lister, J. (1873). A further contribution to the natural history of bacteria and the germ theory of fermentative changes. Quart. Microbiol. Sci. 13, 380–408.
Monera	*Firmicutes*	*Streptococcaceae*	*Lactococcus*	*Lactococcus lactis*	*Lactococcus lactis* subsp. *lactis*	Seafood	Campos, C.A., Rodrıguez, O., Calo-Mata, P., Prado, M., Barros-Velazquez, J. (2006). Preliminary characterization of bacteriocins from Lactococcus lactis, Enterococcus faecium and Enterococcus mundtii strains isolated from turbot (Psetta maxima) Food Research International 39 p356–364 Sarika, A.R., Lipton, A.P., Aishwarya, M.S., Dhivya, R.S. (2012). Isolation of Bacteriocin-Producing Lactococccus lactis and Application of Its Bacteriocin to Manage Spoilage Baceria in High-Value Marine Fish Under Different Storage Temperatures. Appl. Biochem Biotechnol 167, 1280-1289.	ATCC 19435	Lister, J. (1873). A further contribution to the natural history of bacteria and the germ theory of fermentative changes. Quart. Microbiol. Sci. 13, 380–408.
Monera	*Firmicutes*	*Streptococcaceae*	*Lactococcus*	*Lactococcus lactis*	*Lactococcus lactis* subsp. *lactis*	Alcoholic Beverages	Todorov, S.D., Dicks, L.M.T. (2004). Screening of Lactic-Acid Bacteria from South African Barley Beer for Production of Bacteriocin-like Compounds Folia Microbiol. 49 (4) 406-410,	ATCC 19435	Lister, J. (1873). A further contribution to the natural history of bacteria and the germ theory of fermentative changes. Quart. Microbiol. Sci. 13, 380–408.
Monera	*Firmicutes*	*Streptococcaceae*	*Lactococcus*	*Lactococcus lactis*	*Lactococcus lactis* subsp. *lactis*	Alcoholic Beverages	Lui, H.C. & Lui, S.S.T. (1981). Effects of malo-lactic fermentative bacteria on the acidity of white wine, Taiwania, Vol. 26	ATCC 19435	Lister, J. (1873). A further contribution to the natural history of bacteria and the germ theory of fermentative changes. Quart. Microbiol. Sci. 13, 380–408.
Monera	*Firmicutes*	*Streptococcaceae*	*Lactococcus*	*Lactococcus lactis*	*Lactococcus lactis* subsp. *lactis*	Plant Based	Uhlman, L., Schillinger, U., Rupnow, J.R. and Holzapfel, W.H. (1992). Identification and characterization of two bacteriocin-producing strains of Lactococcus lactis isolated from vegetables. IJFM 16 p141-151	ATCC 19435	Lister, J. (1873). A further contribution to the natural history of bacteria and the germ theory of fermentative changes. Quart. Microbiol. Sci. 13, 380–408.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Streptococcaceae*	*Lactococcus*	*Lactococcus laudensis*		Dairy	Tidona, F., Meucci, A., Povolo, M., Pelizzola, V., Zago, M., Contarini, G., Carminati, D., Giraffa, G. (2018). Applicability of Lactococcus hircilactis and Lactococcus laudensis as dairy cultures. Int J Food Microbiol. 2018 Apr 20;271:1-7. doi: 10.1016/j.ijfoodmicro.2018.02.015.	DSM 28960	Meucci, A., Zago, M., Rossetti, L., Fornasari, M.E., Bonvini, B., Tidona, F., Povolo, M., Contarini, G., Carminati, D., Giraffa, G. (2015). Lactococcus hircilactis sp. nov. and Lactococcus laudensis sp. nov., isolated from milk. Int J Syst Evol Microbiol. 2015 Jul;65(7):2091-2096. doi: 10.1099/ijs.0.000225
Monera	*Firmicutes*	*Streptococcaceae*	*Lactococcus*	*Lactococcus piscium*		Seafood	Leroi, F., Cornet, J., Chevalier, F., Cardinal, M., Coeuret, G., Chaillou, S., Joffraud., J.J. (2015). Selection of bioprotective cultures for preventing cold-smoked salmon spoilage. IJFM 213, 79-87. Saraoui, T., Leroi, F., Bjorkroth, J. and Pilet, M.F. (2016). Lactococcus piscium: a psychrotrophic lactic acid bacterium with bioprotective or spoilage activity in food—a review. Journal of Applied Microbiology 121 p907-918	ATCC 700018	Williams, A.M., Fryer, J.L., Del Collins, M. (1990). Lactococcus piscium sp. Nov. A new Lactococcus species from salmonid fish. FEMS Micribiology Letters 56, 109-113.
Monera	*Firmicutes*	*Streptococcaceae*	*Lactococcus*	*Lactococcus piscium*		Meat	Saroui, T., Leroi, F., Björkroth, J. and Pilet, M.F. (2016). Lactococcus piscium: a psychrotophic lactic acid bacterium with bioprotective or spoilage activity in food-a review. J. Appl. Microbiol., 121, 907-918.	ATCC 700018	Williams, A.M., Fryer, J.L., Del Collins, M. (1990). Lactococcus piscium sp. Nov. A new Lactococcus species from salmonid fish. FEMS Micribiology Letters 56, 109-113.
Monera	*Firmicutes*	*Streptococcaceae*	*Lactococcus*	*Lactococcus raffinolactis*		Dairy	Ouadghiri, M., Amar, M., Vancanneyt, M., Swings, J. (2005). Biodiversity of lactic acid bacteria in Moroccan soft white cheese (Jben).FEMS Microbiol Lett. 251, 267-71.	ATCC 43920	Orla-Jensen, A.D., Hansen, P.A. (1932). The bacteriological flora of spontaneously soured milk and of commercial starters for butter making. Zentralbl. Bakteriol. Parasitenkd. Infektionskr Hyg. Abt. 2 86, 6-29.
Monera	*Firmicutes*	*Streptococcaceae*	*Lactococcus*	*Lactococcus raffinolactis*		Plant Based	Jung, M.Y., Lee, C., Seo, MJ. et al. (2020). Characterization of a potential probiotic bacterium Lactococcus raffinolactis WiKim0068 isolated from fermented vegetable using genomic and in vitro analyses. BMC Microbiol 20, 136. https://doi.org/10.1186/s12866-020-01820-9	ATCC 43920	Orla-Jensen, A.D., Hansen, P.A. (1932). The bacteriological flora of spontaneously soured milk and of commercial starters for butter making. Zentralbl. Bakteriol. Parasitenkd. Infektionskr Hyg. Abt. 2 86, 6-29.
Monera	*Firmicutes*	*Streptococcaceae*	*Streptococcus*	*Streptococcus gallolyticus*	*Streptococcus gallolyticus* subsp. *macedonicus*	Dairy	Tarrah, A., da Silva Duarte, V., Pakroo, S., Corich, V., Giacomini, A. (2019). Genomic and phenotypic assessments of safety and probiotic properties of Streptococcus macedonicus strains of dairy origin. Food Res Int. 2020 Apr;130:108931. doi: 10.1016/j.foodres.2019.108931. Epub 2019 Dec 26. PMID: 32156379. Georgalaki, M.D., Sarantinopoulos, P., Ferreira, E.S., De Vuyst, L., Kalantzopoulos, G., Tsakalidou, E. (2000). Biochemical properties of Streptococcus macedonicus strains isolated from Greek Kasseri cheese. Journal of Applied Microbiology 88, 817-25.	ATCC BAA249 DSM 15879	Schlegel, L., Grimont, F., Ageron, E., Grimont, P.A.D., Bouvet, A. (2003). Reappraisal of the taxonomy of the Streptococcus bovis/Streptococcus equinus complex and related species: description of Streptococcus gallolyticus subsp. gallolyticus subsp. nov., S. gallolyticus subsp. macedonicus subsp. nov. and S. gallolyticus subsp. pasteurianus subsp. nov. Int J Syst Evol Microbiol. 2003 May;53(Pt 3):631-645. doi: 10.1099/ijs.0.02361-0. PMID: 12807180
Monera	*Firmicutes*	*Streptococcaceae*	*Streptococcus*	*Streptococcus salivarius*	*Streptococcus salivarius* subsp. *thermophilus*	Dairy	Sherman, J.M., Stark, P. (1938). The Fermentation of Disaccharides by Streptococcus thermophilus. J Bacteriol. 36, 77-81.	ATCC 19258 DSM 20617	Orla-Jensen, S. (1924). La classification des bactéries lactiques. Lait 4, 468–474.
Monera	*Firmicutes*	*Streptococcaceae*	*Streptococcus*	*Streptococcus salivarius*	*Streptococcus salivarius* subsp. *thermophilus*	Plant Based	Michaylova, M. et al. (2007). Isolation and characterization of Lactobacillus delbrueckii ssp. bulgaricus and Streptococcus thermophilus from plants in Bulgaria. FEMS Microbiol. Lett., 269, 160-169. Simsek, Ö., Özel, S. and Con, A.H. (2017). Comparison of lactic acid bacteria diversity during the fermentation of Tarhana produced at home and on a commercial scale. Food Sci. Technol., 26, 181-187.	ATCC 19258 DSM 20617	Orla-Jensen, S. (1924). La classification des bactéries lactiques. Lait 4, 468–474.
Monera	*Firmicutes*	*Streptococcaceae*	*Streptococcus*	*Streptococcus salivarius*	*Streptococcus salivarius* subsp. *thermophilus*	Plant Based	Zhao, J. et al. (2009). Changes in microbial community during Chinese traditional soybean paste fermentation. Int. J. Food Sci. Technol., 44, 2526-2530.	ATCC 19258 DSM 20617	Orla-Jensen, S. (1924). La classification des bactéries lactiques. Lait 4, 468–474.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Firmicutes*	*Streptococacceae*	*Streptococcus*	*Streptococcus salivarius*	*Streptococcus salivarius* subsp. *salivarius*	Plant Based	Ongol, M.P., Asano, K. (2009). Main microorganisms involved in the fermentation of Ugandan ghee. Int J Food Microbiol. 133, 286-91. Chun, J., Kim, G.M., Lee, K., Choi, I.D., Kwon, G.H., Park, J.Y., Jeong, S.J., Kim, J.S., Kim, J.H. (2007). Conversion of Isoflavone Glucosides to Aglycones in Soymilk by Fermentation with Lactic Acid Bacteria. J Food Science 72(2) M39-44	ATCC 7073	Andrewes, F.W., Horder, T.J. (1906). A study of the streptococci pathogenic for man. Lancet ii:708-713.
Monera	*Firmicutes*	*Thermoactinomycetaceae*	*Thermoactinomyces*	*Thermoactinomyces daqus*		Alcoholic Beverages	Liu, H.Q., Yu, H.J., Zhai, L., Bai, F.R., Yao, S. (2021). Optimization of conditions and enzymatic properties of thermophilic protease production of Thermoactinomyces daqus CICC10681[J]. Food and Fermentation Industries:1-10[2021-02-10].https://doi.org/10.13995/j.cnki.11-1802/ts.025828. (in Chinese)	CICC 10681	Yao, S., Liu, Y., Zhang, M. et al. (2014). Thermoactinomyces daqus sp. nov., a thermophilic bacterium isolated from high-temperature Daqu[J]. Int J Syst Evol Microbiol, 2014, 64:206-210.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter aceti*	*Acetobacter aceti* subsp. *aceti*	Dairy	Belloso-Morales, G., Hernández-Sánchez, H. (2003). Manufacture of a beverage from cheese whey using a tea fungus fermentation. Rev Latinoam Microbiol. 45: 5-11.	ATCC 15973	De Ley, J., Frateur, J. (1974). Genus Acetobacter. In: Buchanan, R.E., Gibbons, N.E. (Eds.), Bergey's Manualof Determinative Bacteriology, 8th ed. Williams andWilkins. Baltimore, MD. 276–278.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter aceti*	*Acetobacter aceti* subsp. *aceti*	Vinegar	Dias, D.R., Silva, M.S., de Souza, A.C., Magalhães-Guedes, K.T., de Rezende Ribeiro, F.S., Schwan, R.F. (2016). Vinegar Production from Jabuticaba (Myrciaria jaboticaba) Fruit Using Immobilized Acetic Acid Bacteria. Food Technol Biotechnol. 54: 351-359.	ATCC 15973	De Ley, J., Frateur, J. (1974). Genus Acetobacter. In: Buchanan, R.E., Gibbons, N.E. (Eds.), Bergey's Manualof Determinative Bacteriology, 8th ed. Williams andWilkins. Baltimore, MD. 276–278.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter aceti*	*Acetobacter aceti* subsp. *aceti*	Vinegar	Beppu, T. (1993-1994). Genetic organization of Acetobacter for acetic acid fermentation. Antonie Van Leeuwenhoek. 64, 121-35.	ATCC 15973	De Ley, J., Frateur, J. (1974). Genus Acetobacter. In: Buchanan, R.E., Gibbons, N.E. (Eds.), Bergey's Manual of Determinative Bacteriology, 8th ed. Williams and Wilkins. Baltimore, MD. 276–278.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter conturbans*		Alcoholic Beverages	Sombolestani, A.S., Cleenwerck, I., Cnockaert, M., Borremans, W., Wieme, A.D., De Vuyst, L., Vandamme, P. (2020). Novel acetic acid bacteria from cider fermentations: Acetobacter conturbans sp. nov. and Acetobacter fallax sp. nov. Int J Syst Evol Microbiol. 2020 Dec;70(12):6163-6171. doi: 10.1099/ijsem.0.004511. PMID: 33052084.	NCIMB 8945	Sombolestani, A.S., Cleenwerck, I., Cnockaert, M., Borremans, W., Wieme, A.D., De Vuyst, L., Vandamme, P. (2020). Novel acetic acid bacteria from cider fermentations: Acetobacter conturbans sp. nov. and Acetobacter fallax sp. nov. Int J Syst Evol Microbiol. 2020 Dec;70(12):6163-6171. doi: 10.1099/ijsem.0.004511. PMID: 33052084.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter fabarum*		Plant Based	Cleenwerck, I. (2008). Acetobacter fabarum sp. nov., an acetic acid bacterium from a Ghanaian cocoa bean heap fermentation.Int J Syst Evol Microbiol. 58(Pt 9), 2180-5.	DSM 19596	Cleenwerck, I. (2008). Acetobacter fabarum sp. nov., an acetic acid bacterium from a Ghanaian cocoa bean heap fermentation.Int J Syst Evol Microbiol. 58(Pt 9), 2180-5.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter fabarum*		Dairy	Garofalo, C., Osimani, A., Milanović, V., Aquilanti, L., De Filippis, F., Stellato, G., Di Mauro, S., Turchetti, B., Buzzini, P., Ercolini, D., Clementi, F. (2015). Bacteria and yeast microbiota in milk kefir grains from different Italian regions. Food Microbiol. 49:123-33	DSM 19596	Cleenwerck, I. (2008). Acetobacter fabarum sp. nov., an acetic acid bacterium from a Ghanaian cocoa bean heap fermentation.Int J Syst Evol Microbiol. 58(Pt 9), 2180-5.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter fabarum*		Plant Based	Qin, H., Sun, S., Pan, X., Qiao, Z., Yang, H. (2016). Microbial Diversity and Biochemical Analysis of Suanzhou: A Traditional Chinese Fermented Cereal Gruel. Front Microbiol. 7:1311	DSM 19596	Cleenwerck, I. (2008). Acetobacter fabarum sp. nov., an acetic acid bacterium from a Ghanaian cocoa bean heap fermentation.Int J Syst Evol Microbiol. 58(Pt 9), 2180-5.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter fallax*		Alcoholic Beverages	Sombolestani, A.S., Cleenwerck, I., Cnockaert, M., Borremans, W., Wieme, A.D., De Vuyst, L., Vandamme, P. (2020). Novel acetic acid bacteria from cider fermentations: Acetobacter conturbans sp. nov. and Acetobacter fallax sp. nov. Int J Syst Evol Microbiol. 2020 Dec;70(12):6163-6171. doi: 10.1099/ijsem.0.004511. PMID: 33052084.	NCIMB 8956	Sombolestani, A.S., Cleenwerck, I., Cnockaert, M., Borremans, W., Wieme, A.D., De Vuyst, L., Vandamme, P. (2020). Novel acetic acid bacteria from cider fermentations: Acetobacter conturbans sp. nov. and Acetobacter fallax sp. nov. Int J Syst Evol Microbiol. 2020 Dec;70(12):6163-6171. doi: 10.1099/ijsem.0.004511. PMID: 33052084.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter ghanensis*		Plant Based	Illeghems, K., Pelicaen, R., De Vuyst, L., Weckx, S. (2016). Assessment of the contribution of cocoa-derived strains of Acetobacter ghanensis and Acetobacter senegalensis to the cocoa bean fermentation process through a genomic approach. Food Microbiol. 58: 68-78.	DSM 18895	Cleenwerck, I., Camu, N., Engelbeen, K., De Winter, T., Vandemeulebroecke, K., De Vos, P., De Vuyst, L. (2007). Acetobacter ghanensis sp. nov., a novel acetic acid bacterium isolated from traditional heap fermentations of Ghanaian cocoa beans. Int J Syst Evol Microbiol. 57: 1647-1652.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter lambici*		Alcoholic Beverages	Spitaels, F., Li, L., Wieme, A., Balzarini, T., Cleenwerck, I., Van Landschoot, A., De Vuyst, L., Vandamme, P. (2014). Acetobacter lambici sp. nov., isolated from fermenting lambic beer. Int J Syst Evol Microbiol 2014; 64:1083-1089.	DSM 27328	Spitaels, F., Li, L., Wieme, A., Balzarini, T., Cleenwerck, I., Van Landschoot, A., De Vuyst, L., Vandamme, P. (2014). Acetobacter lambici sp. nov., isolated from fermenting lambic beer. Int J Syst Evol Microbiol 2014; 64:1083-1089.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter lovaniensis*		Dairy	Ongol, M.P., Asano, K. (2009). Main microorganisms involved in the fermentation of Ugandan ghee. Int J Food Microbiol. 133, 286-91.	ATCC 12875	Lisdiyanti, P., Kawasaki, H., Seki, T., Yamada, Y., Uchimura, T. & Komagata, K. (2000). Systematic study of the genus Acetobacter with descriptions of Acetobacter indonesiensis sp. nov., Acetobacter tropicalis sp. nov., Acetobacter orleanensis (Henneberg 1906) comb. nov., Acetobacter lovaniensis (Frateur 1950) comb. nov., and Acetobacter estunensis (Carr 1958) comb. nov. J Gen Appl Microbiol. 46(3), 147-165.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter malorum*		Plant Based	Hidalgo, C., Torija, M.J., Mas, A., Mateo, E. (2013). Effect of inoculation on strawberry fermentation and acetification processes using native strains of yeast and acetic acid bacteria. Food Microbiol. 34: 88-94.	DSM 14337	Cleenwerck, I. (2002). Re-examination of the genus Acetobacter, with descriptions of Acetobacter cerevisiae sp. nov. and Acetobacter malorum sp. nov.Int J Syst Evol Microbiol. 52(Pt 5), 1551-8.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter malorum*		Vinegar	Gullo, M. (2008). Acetic acid bacteria in traditional balsamic vinegar: phenotypic traits relevant for starter cultures selection. Int J Food Microbiol. 125, 46-53.	DSM 14337	Cleenwerck, I. (2002). Re-examination of the genus Acetobacter, with descriptions of Acetobacter cerevisiae sp. nov. and Acetobacter malorum sp. nov. Int J Syst Evol Microbiol. 52(Pt 5), 1551-8.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter nitrogenifigens*		Plant Based	Jayabalan, R., Malbasa, R.V., Loncar, E.S., Vitas, J.S. and Sathishkumar, M. (2014). A Review on Kombucha Tea—Microbiology, Composition, Fermentation, Beneficial Effects, Toxicity, and Tea Fungus. Comprehensive Reviews in Food Science and Food Safety Vol. 13	LMG 23498	Dutta, D., Gachhui, R. (2006). Novel nitrogen-fixing Acetobacter nitrogenifigens sp. nov., isolated from Kombucha tea. Int. J. Syst. Evol. Microbiol., 2006, 56, 1899-1903.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter orientalis*		Alcoholic Beverages	De Roos, J., Verce, M., Aerts, M., Vandamme, P., De Vuyst, L. (2018). Temporal and Spatial Distribution of the Acetic Acid Bacterium Communities throughout the Wooden Casks Used for the Fermentation and Maturation of Lambic Beer Underlines Their Functional Role. Appl Environ Microbiol. 84(7):e02846-17.	ATCC 12875	Lisdiyanti, P. (2001). Identification of Acetobacter strains isolated from Indonesian sources, and proposals of Acetobacter syzygii sp. nov., Acetobacter cibinongensis sp. nov., and Acetobacter orientalis sp. nov. J Gen Appl Microbiol. 47, 119-131.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter orientalis*		Dairy	Ongol, M.P., Asano, K. (2009). Main microorganisms involved in the fermentation of Ugandan ghee. Int J Food Microbiol. 133, 286-91.	ATCC 12875	Lisdiyanti, P. (2001). Identification of Acetobacter strains isolated from Indonesian sources, and proposals of Acetobacter syzygii sp. nov., Acetobacter cibinongensis sp. nov., and Acetobacter orientalis sp. nov. J Gen Appl Microbiol. 47, 119-131.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter orientalis*		Plant Based	Tanasupawat, S., Kommanee, J., Yukphan, P., Nakagawa, Y., Yamada, Y. (2011). Identification of Acetobacter strains from Thai fermented rice products based on the 16S rRNA gene sequence and 16S–23S rRNA gene internal transcribed spacer restriction analyses. J Sci Food Agric 91(14):2652-2659	ATCC 12875	Lisdiyanti, P. (2001). Identification of Acetobacter strains isolated from Indonesian sources, and proposals of Acetobacter syzygii sp. nov., Acetobacter cibinongensis sp. nov., and Acetobacter orientalis sp. nov. J Gen Appl Microbiol. 47, 119-131.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter orleanensis*		Vinegar	Mamlouk, D., Hidalgo, C., Torija, M.J. et al. (2011). Evaluation and optimisation of bacterial genomic DNA extraction for no-culture techniques applied to vinegars[J].Food Microbiol, 2011, 28(7):1374-1379.	ATCC 12876	Lisdiyanti, P., Kawasaki, H., Seki, T., Yamada, Y., Uchimura, T. & Komagata, K. (2000). Systematic study of the genus Acetobacter with descriptions of Acetobacter indonesiensis sp. nov. Acetobacter tropicalis sp. nov. Acetobacter orleanensis (henneberg 1906) comb. nov. Acetobacter lovaniensis (frateur 1950) comb. nov. and Acetobacter estunensis (Carr 1958) comb. nov. J Gen Appl Microbiol. 46(3), 147-165.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter pasteurianus*	*Acetobacter pasteurianus* subsp. *pasteurianus*	Vinegar	Nanda, K., Taniguchi, M., Ujike, S., Ishihara, N., Mori, H., Ono, H., Murooka, Y. (2001). Characterization of acetic acid bacteria in traditional acetic acid fermentation of rice vinegar (komesu) and unpolished rice vinegar (kurosu) produced in Japan. Appl Environ Microbiol. 67, 986-90.	ATCC 838	De Ley, J., Frateur, J. (1974). Genus Acetobacter. In: Buchanan, R.E., Gibbons, N.E. (Eds.), Bergey's Manual of Determinative Bacteriology, 8th ed. Williams and Wilkins. Baltimore, MD. 276–278.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter pasteurianus*	*Acetobacter pasteurianus* subsp. *pasteurianus*	Plant Based	Nielsen, D.S. (2007). The microbiology of Ghanaian cocoa fermentations analysed using culture-dependent and culture-independent methods.Int J Food Microbiol. 114, 168-86.	ATCC 838	De Ley, J., Frateur, J. (1974). Genus Acetobacter. In: Buchanan, R.E., Gibbons, N.E. (Eds.), Bergey's Manual of Determinative Bacteriology, 8th ed. Williams and Wilkins. Baltimore, MD. 276–278.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter pomorum*		Vinegar	Sokollek, S.J., Hertel, C., Hammes, W.P. (1998). Description of Acetobacter oboediens sp. nov. and Acetobacter pomorum sp. nov., two new species isolated from industrial vinegar fermentations. Int. J. Syst. Bacteriol. 48, 935–940.	DSM 11825	Sokollek, S.J., Hertel, C., Hammes, W.P. (1998b). Description of Acetobacter oboediens sp. nov. and Acetobacter pomorum sp. nov., two new species isolated from industrial vinegar fermentations. Int. J. Syst. Bacteriol. 48, 935–940.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter sicerae*		Alcoholic Beverages	Li, L., Wieme, A., Spitaels, F., Balzarini, T., Nunes, O.C., Manaia, C.M., Van Landschoot, A., De Vuyst, L., Cleenwerck, I., Vandamme, P. (2014). Acetobacter sicerae sp. nov., isolated from cider and kefir, and identification of species of the genus Acetobacter by dnaK, groEL and rpoB sequence analysis. Int J Syst Evol Microbiol. 2014 Jul;64(Pt 7):2407-2415. doi: 10.1099/ijs.0.058354-0. Epub 2014 Apr 24. PMID: 24763601.	NCIMB 8941	Li, L., Wieme, A., Spitaels, F., Balzarini, T., Nunes, O.C., Manaia, C.M., Van Landschoot, A., De Vuyst, L., Cleenwerck, I., Vandamme, P. (2014). Acetobacter sicerae sp. nov., isolated from cider and kefir, and identification of species of the genus Acetobacter by dnaK, groEL and rpoB sequence analysis. Int J Syst Evol Microbiol. 2014 Jul;64(Pt 7):2407-2415. doi: 10.1099/ijs.0.058354-0. Epub 2014 Apr 24. PMID: 24763601.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter syzygii*		Vinegar	Yetiman, A.E., Kesmen, Z. (2015). Identification of acetic acid bacteria in traditionally produced vinegar and mother of vinegar by using different molecular techniques. Int J Food Microbiol. 204:9-16	IFO 16604	Lisdiyanti, P., Kawasaki, H., Seki, T., Yamada, Y., Uchimura, T., Komagata, K. (2001). Identification of Acetobacter strains isolated from Indonesian sources, and proposals of Acetobacter syzygii sp. nov., Acetobacter cibinongensis sp. nov., and Acetobacter orientalis sp. nov. J Gen Appl Microbiol. 47, 119-131.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter syzygii*		Plant Based	Nielsen, D.S. (2007). The microbiology of Ghanaian cocoa fermentations analysed using culture-dependent and culture-independent methods.Int J Food Microbiol. 114, 168-86.	IFO 16604	Lisdiyanti, P., Kawasaki, H., Seki, T., Yamada, Y., Uchimura, T., Komagata, K. (2001). Identification of Acetobacter strains isolated from Indonesian sources, and proposals of Acetobacter syzygii sp. nov., Acetobacter cibinongensis sp. nov., and Acetobacter orientalis sp. nov. J Gen Appl Microbiol. 47, 119-131.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Acetobacter*	*Acetobacter tropicalis*		Plant Based	Nielsen, D.S. (2007). The microbiology of Ghanaian cocoa fermentations analysed using culture-dependent and culture-independent methods.Int J Food Microbiol. 114, 168-86.	IFO 16470	Lisdiyanti, P., Kawasaki, H., Seki, T., Yamada, Y., Uchimura, T., Komagata, K. (2000). Systematic study of the genus Acetobacter with descriptions of Acetobacter indonesiensis sp. nov., Acetobacter tropicalis sp. nov., Acetobacter orleanensis (Henneberg 1906) comb. nov., Acetobacter lovaniensis (Frateur 1950) comb. nov., and Acetobacter estunensis (Carr 1958) comb. nov. J Gen Appl Microbiol. 46, 147-165.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Proteobacteria*	*Acetobacteraceae*	*Gluconacetobacter*	*Gluconacetobacter azotocaptans*		Plant Based	Fuentes-Ramírez, L.E., Bustillos-Cristales, R., Tapia-Hernandez, A., Jimenez-Salgado, T., Wang, E.T., Martinez-Romero, E., Caballero-Mellado, J. (2001). Novel nitrogen-fixing acetic acid bacteria, Gluconacetobacter johannae sp. nov. and Gluconacetobacter azotocaptans sp. nov., associated with coffee plants. Int. J. Syst. Evol. Microbiol. 51, 1305–1314.	ATCC 700988	Fuentes-Ramírez, L.E., Bustillos-Cristales, R., Tapia-Hernandez, A., Jimenez-Salgado, T., Wang, E.T., Martinez-Romero, E., Caballero-Mellado, J. (2001). Novel nitrogen-fixing acetic acid bacteria, Gluconacetobacter johannae sp. nov. and Gluconacetobacter azotocaptans sp. nov., associated with coffee plants. Int. J. Syst. Evol. Microbiol. 51, 1305–1314.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Gluconacetobacter*	*Gluconacetobacter azotocaptans*		Plant Based	Fuentes-Ramírez, L.E., Bustillos-Cristales, R., Tapia-Hernandez, A., Jimenez-Salgado, T., Wang, E.T., Martinez-Romero, E., Caballero-Mellado, J. (2001). Novel nitrogen-fixing acetic acid bacteria, Gluconacetobacter johannae sp. nov. and Gluconacetobacter azotocaptans sp. nov., associated with coffee plants. Int. J. Syst. Evol. Microbiol. 51, 1305–1314.	ATCC 700988	Fuentes-Ramírez, L.E., Bustillos-Cristales, R., Tapia-Hernandez, A., Jimenez-Salgado, T., Wang, E.T., Martinez-Romero, E., Caballero-Mellado, J. (2001). Novel nitrogen-fixing acetic acid bacteria, Gluconacetobacter johannae sp. nov. and Gluconacetobacter azotocaptans sp. nov., associated with coffee plants. Int. J. Syst. Evol. Microbiol. 51, 1305–1314.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Gluconacetobacter*	*Gluconacetobacter diazotrophicus*		Plant Based	Jimenez-Salgado, T. (1997). Coffea arabica L., a new host plant for Acetobacter diazotrophicus, and isolation of other nitrogen-fixing acetobacteria. Appl Environ Microbiol. 63, 3676-83.	ATCC 49037	Yamada, Y., Hoshino, K.-I., Ishikawa, T. (1998). Validation of publication of new names and new combinations previously effectively published outside the IJSB. List No. 64: Gluconacetobacter nom. corrig. (Gluconoacetobacter [sic]). Int. J. Syst. Bacteriol. 48, 327–328.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Gluconacetobacter*	*Gluconacetobacter diazotrophicus*		Plant Based	Jimenez-Salgado, T. (1997). Coffea arabica L., a new host plant for Acetobacter diazotrophicus, and isolation of other nitrogen-fixing acetobacteria. Appl Environ Microbiol. 63, 3676-83.	ATCC 49037	Yamada, Y., Hoshino, K.-I., Ishikawa, T. (1998). Validation of publication of new names and new combinations previously effectively published outside the IJSB. List No. 64: Gluconacetobacter nom. corrig. (Gluconoacetobacter [sic]). Int. J. Syst. Bacteriol. 48, 327–328.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Gluconacetobacter*	*Gluconacetobacter entanii*		Vinegar	Schüller, G., Hertel, C., Hammes, W.P. (2000). Gluconacetobacter entanii sp. nov., a new species isolated from submerged high-acid industrial vinegar fermentations. Int. J. Syst. Evol. Microbiol. 50, 2013–2020.	LTH 4560	Schüller, G., Hertel, C., Hammes, W.P. (2000). Gluconacetobacter entanii sp. nov., a new species isolated from submerged high-acid industrial vinegar fermentations. Int. J. Syst. Evol. Microbiol. 50, 2013–2020.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Gluconacetobacter*	*Gluconacetobacter johannae*		Plant Based	Fuentes-Ramírez, L.E., Bustillos-Cristales, R., Tapia-Hernandez, A., Jimenez-Salgado, T., Wang, E.T., Martinez-Romero, E., Caballero-Mellado, J. (2001). Novel nitrogen-fixing acetic acid bacteria, Gluconacetobacter johannae sp. nov. and Gluconacetobacter azotocaptans sp. nov., associated with coffee plants. Int. J. Syst. Evol. Microbiol. 51, 1305–1314.	ATCC 700987	Fuentes-Ramírez, L.E., Bustillos-Cristales, R., Tapia-Hernandez, A., Jimenez-Salgado, T., Wang, E.T., Martinez-Romero, E., Caballero-Mellado, J. (2001). Novel nitrogen-fixing acetic acid bacteria, Gluconacetobacter johannae sp. nov. and Gluconacetobacter azotocaptans sp. nov., associated with coffee plants. Int. J. Syst. Evol. Microbiol. 51, 1305–1314.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Gluconacetobacter*	*Gluconacetobacter johannae*		Plant Based	Fuentes-Ramírez, L.E., Bustillos-Cristales, R., Tapia-Hernandez, A., Jimenez-Salgado, T., Wang, E.T., Martinez-Romero, E., Caballero-Mellado, J. (2001). Novel nitrogen-fixing acetic acid bacteria, Gluconacetobacter johannae sp. nov. and Gluconacetobacter azotocaptans sp. nov., associated with coffee plants. Int. J. Syst. Evol. Microbiol. 51, 1305–1314.	ATCC 700987	Fuentes-Ramírez, L.E., Bustillos-Cristales, R., Tapia-Hernandez, A., Jimenez-Salgado, T., Wang, E.T., Martinez-Romero, E., Caballero-Mellado, J. (2001). Novel nitrogen-fixing acetic acid bacteria, Gluconacetobacter johannae sp. nov. and Gluconacetobacter azotocaptans sp. nov., associated with coffee plants. Int. J. Syst. Evol. Microbiol. 51, 1305–1314.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Gluconacetobacter*	*Gluconacetobacter kombuchae*		Plant Based	Jayabalan, R., Malbasa, R.V., Loncar, E.S., Vitas, J.S. and Sathishkumar, M. (2014). A Review on Kombucha Tea—Microbiology, Composition, Fermentation, Beneficial Effects, Toxicity, and Tea Fungus. Comprehensive Reviews in Food Science and Food Safety Vol. 13	LMG 23726	Dutta, D. and Gachhui, R. (2007). Nitrogen-fixing and cellulose-producing Gluconacetobacter kombuchae sp. nov., isolated from Kombucha tea. Int. J. Syst. Evol. Microbiol., 2007, 57, 353-357.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Proteobacteria*	*Acetobacteraceae*	*Gluconacetobacter*	*Gluconacetobacter xylinus*		Vinegar	Gullo, M., Caggia, C., De Vero, L., Giudici, P. (2006). Characterization of acetic acid bacteria in traditional balsamic vinegar. Int J Food Microbiol. 106, 209-12.	ATCC 23767	Yamada, Y., Hoshino, K.-I., Ishikawa, T. (1998). Validation of publication of new names and new combinations previously effectively published outside the IJSB. List No. 64: Gluconacetobacter nom. corrig. (Gluconoacetobacter [sic]). Int. J. Syst. Bacteriol. 48, 327–328.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Gluconobacter*	*Gluconobacter oxydans*		Vinegar	De Muynck, C. (2007). The genus Gluconobacter oxydans: comprehensive overview of biochemistry and biotechnological applications. Crit Rev Biotechnol. 27(3):147-71.	ATCC 19357	(Henneberg, 1897) DeLey, J. (1961). Comparative carbohydrate metabolism and a proposal for the phylogenetic relationship of the acetic acid bacteria. J. Gen. Microbiol. 24:31-50.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Komagataeibacter*	*Komagataeibacter europaeus*		Vinegar	Gullo, M. (2008). Acetic acid bacteria in traditional balsamic vinegar: phenotypic traits relevant for starter cultures selection.Int J Food Microbiol. 125, 46-53.	ATCC 51845	Yamada, Y., Yukphan, P., Lan Vu, H.T., Muramatsu, Y., Ochaikul, D., Nakagawa, Y. (2012). Subdivision of the genus Gluconacetobacter Yamada, Hoshino and Ishikawa 1998: the proposal of Komagatabacter gen. nov., for strains accomodated to the Gluconacetobacter xylinus group in the α-Proteobacteria. Ann. Microbiol., 2012, 62, 849-859.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Komagataeibacter*	*Komagataeibacter hansenii*		Vinegar	Torija, M.J. (2010). Identification and quantification of acetic acid bacteria in wine and vinegar by TaqMan-MGB probes. Food Microbio. 27, 257-65.	ATCC 35959	Yamada, Y., Yukphan, P., Lan Vu, H.T., Muramatsu, Y., Ochaikul, D., Nakagawa, Y. (2012). Subdivision of the genus Gluconacetobacter Yamada, Hoshino and Ishikawa 1998: the proposal of Komagatabacter gen. nov., for strains accomodated to the Gluconacetobacter xylinus group in the α-Proteobacteria. Ann. Microbiol., 2012, 62, 849-859.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Komagataeibacter*	*Komagataeibacter intermedius*		Plant Based	Jayabalan, R., Malbasa, R.V., Loncar, E.S., Vitas, J.S. and Sathishkumar, M. (2014). A Review on Kombucha Tea—Microbiology, Composition, Fermentation, Beneficial Effects, Toxicity, and Tea Fungus. Comprehensive Reviews in Food Science and Food Safety Vol. 13	DSM 11804	Yamada, Y., Yukphan, P., Lan Vu, H.T., Muramatsu, Y., Ochaikul, D., Tanasupawat, S., Nakagawa, Y. (2012). Description of Komagataeibacter gen. nov., with proposals of new combinations (Acetobacteraceae). J Gen Appl Microbiol 2012; 58:397-404.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Komagataeibacter*	*Komagataeibacter oboediens*		Vinegar	Sokollek, S.J., Hertel, C., Hammes, W.P. (1998b). Description of Acetobacter oboediens sp. nov. and Acetobacter pomorum sp. nov., two new species isolated from industrial vinegar fermentations. Int. J. Syst. Bacteriol. 48, 935–940.	DSM 11826	Yamada, Y., Yukphan, P., Lan Vu, H.T., Muramatsu, Y., Ochaikul, D., Nakagawa, Y. (2012). Subdivision of the genus Gluconacetobacter Yamada, Hoshino and Ishikawa 1998: the proposal of Komagatabacter gen. nov., for strains accomodated to the Gluconacetobacter xylinus group in the α-Proteobacteria. Ann. Microbiol., 2012, 62, 849-859.
Monera	*Proteobacteria*	*Acetobacteraceae*	*Komagataeibacter*	*Komagataeibacter xylinus*		Plant Based	Jayabalan, R., Malbasa, R.V., Loncar, E.S., Vitas, J.S. and Sathishkumar, M. (2014). A Review on Kombucha Tea—Microbiology, Composition, Fermentation, Beneficial Effects, Toxicity, and Tea Fungus. Comprehensive Reviews in Food Science and Food Safety Vol. 13	DSM 6513	Yamada, Y., Yukphan, P., Lan Vu, H.T., Muramatsu, Y., Ochaikul, D., Tanasupawat, S., Nakagawa, Y. (2012). Description of Komagataeibacter gen. nov., with proposals of new combinations (Acetobacteraceae). J Gen Appl Microbiol 2012; 58:397-404..
Monera	*Proteobacteria*	*Enterobacteriaceae*	*Hafnia*	*Hafnia alvei*		Dairy	Mounier, J., Monnet, C., Vallaeys, T., Arditi, R., Sarthou, A.S., Hélias, A., Irlinger, F. (2008). Microbial interactions within a cheese microbial community. Appl Environ Microbiol. 74, 172-81.	ATCC 13337	Møller, V. (1954). Distribution of amino acid decarboxylases in Enterobacteriaceae. Acta Pathologica et Bacteriologica Scandinavica 35, 259-277.
Monera	*Proteobacteria*	*Enterobacteriaceae*	*Halomonas*	*Halomonas elongata*		Meat	Hinrichsen, L.L., Montel, M.C., Talon, R. (1994). Proteolytic and lipolytic activities of Micrococcus roseus (65), Halomonas elongata (16) and Vibrio sp. (168) isolated from Danish bacon curing brines. Int J Food Microbiol. 22(2-3), 115-26	ATCC 33173	Vreeland, R.H., Litchfield, C.D., Martin, E.L., Elliot, E. (1980). Halomonas elongata, a new genus and species of extremely salt-tolerant bacteria. Int. J. Syst. Bacteriol. 30, 485-495

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Monera	*Proteobacteria*	*Moraxellaceae*	*Psychrobacter*	*Psychrobacter celer*		Dairy	Irlinger, F., Yung, S.A., Sarthou, A.S., Delbès-Paus, C., Montel, M.C., Coton, E., Coton, M., Helinck, S. (2012). Ecological and aromatic impact of two Gram-negative bacteria (Psychrobacter celer and Hafnia alvei) inoculated as part of the whole microbial community of an experimental smear soft cheese. Int J Food Microbiol. 153(3):332-8.	JCM 12601 DSM 23510 KCTC 12313	Yoon, J.H., Lee, C.H., Kang, S.J., Oh, T.K. (2005). Psychrobacter celer sp. nov., isolated from sea water of the South Sea in Korea. Int. J. Syst. Evol. Microbiol., 55, 1885-1890.
Monera	*Proteobacteria*	*Moraxellaceae*	*Psychrobacter*	*Psychrobacter celer*		Seafood	Belleggia, L., Aquilanti, L., Ferrocino, I., Milanović, V., Garofalo, C., Clementi, F., Cocolin, L., Mozzon, M., Foligni, R., Haouet, M.N., Scuota, S., Framboas, M., Osimani, A. (2020). Discovering microbiota and volatile compounds of surströmming, the traditional Swedish sour herring. Food Microbiol. 2020 Oct;91:103503. doi: 10.1016/j.fm.2020.103503. Epub 2020 Apr 9. PMID: 32539969.	JCM 12601 DSM 23510 KCTC 12313	Yoon, J.H., Lee, C.H., Kang, S.J., Oh, T.K. (2005). Psychrobacter celer sp. nov., isolated from sea water of the South Sea in Korea. Int. J. Syst. Evol. Microbiol., 55, 1885-1890.
Monera	*Proteobacteria*	*Moraxellaceae*	*Psychrobacter*	*Psychrobacter cibarius*		Dairy	Feligini, M., Panelli, S., Buffoni, J.N., Bonacina, C., Andrighetto, C., Lombardi, A. (2012). Identification of microbiota present on the surface of Taleggio cheese using PCR-DGGE and RAPD-PCR. J Food Sci. 77(11):M609-15	DSM 16327 KCTC 12256	Jung, S.Y., Lee, M.H., Oh, T.K., Park, Y.H., Yoon, J.H. (2005). Psychrobacter cibarius sp. nov., isolated from jeotgal, a traditional Korean fermented seafood. Int. J. Syst. Evol. Microbiol., 55, 577-582.
Monera	*Proteobacteria*	*Moraxellaceae*	*Psychrobacter*	*Psychrobacter cibarius*		Seafood	Jung, S.Y., Lee, M.H., Oh, T.K., Park, Y.H., Yoon, J.H. (2005). Psychrobacter cibarius sp. nov., isolated from jeotgal, a traditional Korean fermented seafood. Int J Syst Evol Microbiol. 2005 Mar;55(Pt 2):577-582. doi: 10.1099/ijs.0.63398-0. PMID: 15774627.	DSM 16327 KCTC 12256	Jung, S.Y., Lee, M.H., Oh, T.K., Park, Y.H., Yoon, J.H. (2005). Psychrobacter cibarius sp. nov., isolated from jeotgal, a traditional Korean fermented seafood. Int. J. Syst. Evol. Microbiol., 55, 577-582.
Monera	*Proteobacteria*	*Sphingomonadaceae*	*Zymomonas*	*Zymomonas mobilis*	*Zymomonas mobilis* subsp. *mobilis*	Alcoholic Beverages	Rogers, P.L., Goodman, A.E., Heyes, R.H. (1984). Zymomonas ethanol fermentations. Microbiol Sci. 1, 133-6.	ATCC 10988	Swings, J., De Ley, J. (1977). The biology of Zymomonas. Bacteriol Rev. 41, 1-46.
Fungi	*Ascomycota*	*Aspergillaceae*	*Aspergillus*	*Aspergillus luchuensis*		Plant Based	Mogensen, J.M., Varga J., Thrane, U., Frisvad, J.C. (2009). Aspergillus acidus from Puerh tea and black tea does not produce ochratoxin A and fumonisin B2. Int. J. Food Microbiol. 132, 141-144.	CBS 106.47	Houbraken, J., Kocsubé, S., Visagie, C.M., Yilmaz, N. & Frisvad, J.C. (2020). Classification of aspergillus, penicillium, talaromyces and related genera (eurotiales): an overview of families, genera, subgenera, sections, series and species. Studies in Mycology, 95.
Fungi	*Ascomycota*	*Aspergillaceae*	*Aspergillus*	*Aspergillus niger*		Alcoholic Beverages	Nout, R. (2000). Useful role of of fungi in food processing. In: Samson, R.A., Hoekstra, E.S., Frisvad, J.C., Filtenborg, O. (Eds.), Introduction to food- and airborne fungi. 6th ed. Centraalbureau voor Schimmelciultures, Utrecht.	CBS 51388	Houbraken, J., Kocsubé, S., Visagie, C.M., Yilmaz, N. & Frisvad, J.C. (2020). Classification of aspergillus, penicillium, talaromyces and related genera (eurotiales): an overview of families, genera, subgenera, sections, series and species. Studies in Mycology, 95.
Fungi	*Ascomycota*	*Aspergillaceae*	*Aspergillus*	*Aspergillus oryzae*		Plant Based	Bhumiratana, A., Flegel, T.W., Glinsukon, T., Somporan, W. (1980). Isolation and analysis of molds from soy sauce koji in Thailand. Appl Environ Microbiol. 39, 430-5. Miyake, Y., Ito, C., Itoigawa, M., Osawa, T. (2007). Isolation of the Antioxidant Pyranonigrin-A from Rice Mold Starters Used in the Manufacturing Process of Fermented Foods. Biosci Biotechnol Biochem. 71, 2515-21. Barbesgaaard, P., Heldt-Hansen, H.P., Diderichsen, B. (1992). On the safety of aspergillus oryzae: a review. Appl Microbiol Biotechnol. 36, 569-572.	CBS 100925	Houbraken, J., Kocsubé, S., Visagie, C.M., Yilmaz, N. & Frisvad, J.C. (2020). Classification of aspergillus, penicillium, talaromyces and related genera (eurotiales): an overview of families, genera, subgenera, sections, series and species. Studies in Mycology, 95.
Fungi	*Ascomycota*	*Aspergillaceae*	*Aspergillus*	*Aspergillus sojae*		Plant Based	Miyake, Y., Ito, C., Itoigawa, M., Osawa, T. (2007). Isolation of the Antioxidant Pyranonigrin-A from Rice Mold Starters Used in the Manufacturing Process of Fermented Foods. Biosci Biotechnol Biochem. 71, 2515-21.	CBS 100928	Houbraken, J., Kocsubé, S., Visagie, C.M., Yilmaz, N. & Frisvad, J.C. (2020). Classification of aspergillus, penicillium, talaromyces and related genera (eurotiales): an overview of families, genera, subgenera, sections, series and species. Studies in Mycology, 95.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Fungi	*Ascomycota*	*Aspergillaceae*	*Eurotium*	*Eurotium chevalieri*		Alcoholic Beverages	Cui, X.X., Bai, F.R., YU, X.J., Yao. S. (2019). Aroma characteristics of Eurotium chevalieri CICC 41584 and its applicationin aroma Baijiu Daqu production[J]. Food and Fermentation Industries, 45(21): 60-67. (in Chinese)	CBS 522.65	Samson, R.A., Visagie, C.M., Houbraken, J.J., Hong, S.B. & Frisvad, J.C. (2014). Phylogeny, identification and nomenclature of the genus aspergillus. Studies in Mycology, 78(4), 141-173.
Fungi	*Ascomycota*	*Aspergillaceae*	*Eurotium*	*Eurotium cristatum*		Plant Based	Peng, Y., Xiong, Z., Li, J., Huang, J., Teng, C., Gong, Y., Liu, Z. (2014). Water extract of the fungi from Fuzhuan brick tea improves the beneficial function on inhibiting fat deposition. Int J Food Sci Nutr. 65(5):610-4	NRRL 4222	Raper, K.B., Fennell, D.I. (1965). The Genus Aspergillus:169
Fungi	*Ascomycota*	*Aspergillaceae*	*Penicillium*	*Penicillium biforme*		Meat	Lo, Y.C. (2019). Evolution of Penicillium fungi: adaptation and degeneration in fermented food environments. Thèse présentée pour une soutenance à Orsay, le 25 Juin	CBS 297.48	Biourge, P. (1923). Les moissisures du groupe Penicillium Link. La Cellule. 33:7-331. Giraud et al. (2010). Microsatellite loci to recognize species for the cheese starter and contaminating strains associated with cheese manufacturing
Fungi	*Ascomycota*	*Aspergillaceae*	*Penicillium*	*Penicillium biforme*		Dairy	Ropars, J., Didiot, E., de la Vega, R.C.R., Bennetot, B., Coton, M., Poirier, E., Coton, E., Snirc, A., Le Prieur, S., Giraud, T. (2020). Domestication of the Emblematic White Cheese-Making Fungus Penicillium camemberti and Its Diversification into Two Varieties. Curr Biol Nov 16;30(22):4441-4453.e4. doi: 10.1016/j.cub.2020.08.082. Epub 2020 Sep 24.	CBS 297.48	Giraud et al. (2010). Microsatellite loci to recognize species for the cheese starter and contaminating strains associated with cheese manufacturing
Fungi	*Ascomycota*	*Aspergillaceae*	*Penicillium*	*Penicillium biforme*		Dairy	Ropars et al. (2012). A taxonomic and ecological overview of cheese fungi	CBS 297.48	Giraud et al. (2010). Microsatellite loci to recognize species for the cheese starter and contaminating strains associated with cheese manufacturing
Fungi	*Ascomycota*	*Aspergillaceae*	*Penicillium*	*Penicillium camemberti*		Dairy	Ropars, J., Didiot, E., de la Vega, R.C.R., Bennetot, B., Coton, M., Poirier, E., Coton, E., Snirc, A., Le Prieur, S., Giraud, T. (2020). Domestication of the Emblematic White Cheese-Making Fungus Penicillium camemberti and Its Diversification into Two Varieties. Curr Biol Nov 16;30(22):4441-4453.e4. doi: 10.1016/j.cub.2020.08.082. Epub 2020 Sep 24.	CBS 299.48	Thom, C. (1906). Fungi in cheese ripening; Camembert and Roquefort. Bull. Bur. Anim. Ind. US Dep. Agric. 82, 33.
Fungi	*Ascomycota*	*Aspergillaceae*	*Penicillium*	*Penicillium camemberti*		Dairy	Moreau, C. (1979). Nomenclature des Penicillium utiles à la préparation du Camembert. Le Lait 59, 219-233.	CBS 299.48	Thom, C. (1906). Fungi in cheese ripening; Camembert and Roquefort. Bull. Bur. Anim. Ind. US Dep. Agric. 82, 33.
Fungi	*Ascomycota*	*Aspergillaceae*	*Penicillium*	*Penicillium caseifulvum*		Dairy	Suhr, K.I., Haasum, I., Steenstrup, L.D., Larsen, T.O. (2020). Factors Affecting Growth and Pigmentation of Penicillium caseifulvum. J. of dairy sciencevolume 85, issue 11, P2786-2794, November 01.	CBS 101134	Lund, F., Filtenborg, O., Frisvad, J.C. (1998). Penicillium caseifulvum, a new species found on fermented blue cheese. J. Food Mycol. 2, 95-100.
Fungi	*Ascomycota*	*Aspergillaceae*	*Penicillium*	*Penicillium caseifulvum*		Dairy	Lund, F., Filtenborg, O., Frisvad, J.C. (1998). Penicillium caseifulvum, a new species found on fermented blue cheese. J. Food Mycol. 2, 95–100	CBS 101134	Lund, F., Filtenborg, O., Frisvad, J.C. (1998). Penicillium caseifulvum, a new species found on fermented blue cheese. J. Food Mycol. 2, 95-100.
Fungi	*Ascomycota*	*Aspergillaceae*	*Penicillium*	*Penicillium chrysogenum*		Dairy	Lund, F., Filtenborg, O., Frisvad, J.C. (1995). Associated mycoflora of cheese. Food Microbiol.12, 173-180.	CBS 306.48	Thom, C. (1910). U.S.D.A. Bureau of Animal Industry Bulletin 118, 1-107.
Fungi	*Ascomycota*	*Aspergillaceae*	*Penicillium*	*Penicillium commune*		Dairy	Lund, F., Filtenborg, O., Frisvad, J.C. (1995). Associated mycoflora of cheese. Food Microbiol.12, 173-180.	CBS 216.30	Thom, C. (1910). U.S.D.A. Bureau of Animal Industry Bulletin 118, 1-107.
Fungi	*Ascomycota*	*Aspergillaceae*	*Penicillium*	*Penicillium fuscoglaucum*		Meat	Lo, Y-C. (2019). Evolution of Penicillium fungi: adaptation and degeneration in fermented food environments. Thèse présentée pour une soutenance à Orsay, le 25 Juin.	CBS 261.29	Biourge, P. (1923). Les moissisures du groupe Penicillium Link. La Cellule. 33:7-331. Giraud et al. (2010). Microsatellite loci to recognize species for the cheese starter and contaminating strains associated with cheese manufacturing
Fungi	*Ascomycota*	*Aspergillaceae*	*Penicillium*	*Penicillium fuscoglaucum*		Dairy	Ropars et al. (2012). A taxonomic and ecological overview of cheese fungi	CBS 261.29	Giraud et al. (2010). Microsatellite loci to recognize species for the cheese starter and contaminating strains associated with cheese manufacturing

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Fungi	*Ascomycota*	*Aspergillaceae*	*Penicillium*	*Penicillium nalgiovense*		Dairy	Mrázek, J., Pachlová, V., Buňka, F., Černíková, M., Dráb, V., Bejblová, M., Staněk, K., Buňková, L. (2016). Effects of different strains Penicillium nalgiovense in the Nalžovy cheese during ripening. J Sci Food Agric May;96(7):2547-54. doi: 10.1002/jsfa.7375. Epub 2015 Sep 11.	CBS 352.48	Laxa, O. (1932). Über die Reifung des Ellischauer Käses Zentralblatt für Bakteriologie und Parasitenkunde, Abteilung 2, 86, 160-165.
Fungi	*Ascomycota*	*Aspergillaceae*	*Penicillium*	*Penicillium nalgiovense*		Meat	Farber, P., Geisen, R. (1994). Antagonistic Activity of the Food-Related Filamentous Fungus Penicillium nalgiovense by the Production of Penicillin. Appl Environ Mmicrobiol. 60, 3401-3404.	CBS 352.48	Laxa, O. (1932). Über die Reifung des Ellischauer Käses Zentralblatt für Bakteriologie und Parasitenkunde, Abteilung 2, 86, 160-165.
Fungi	*Ascomycota*	*Aspergillaceae*	*Penicillium*	*Penicillium roqueforti*		Dairy	Dumas, E., Feurtey, A., de la Vega, R.C.R., Le Prieur, S., Snirc, A., Coton, M., Thierry, A., Coton, E., Le Piver, M., Roueyre, D., Ropars, J., Branca, A., Giraud, T. (2020). Independent domestication events in the blue-cheese fungus Penicillium roqueforti. Mol Ecol Jul;29(14):2639-2660. doi: 10.1111/mec.15359. Epub 2020 Feb 3.	CBS 221.30	Thom, C. (1906). Fungi in cheese ripening; Camembert and Roquefort. Bull. Bur. Anim. Ind. US Dep. Agric. 82, 33.
Fungi	*Ascomycota*	*Aspergillaceae*	*Penicillium*	*Penicillium roqueforti*		Dairy	Moreau, C. (1980). Le Penicillium roqueforti, morphologie, physiologie, intérêt en industrie fromagère, mycotoxines. (Révision bibliographique). Lait 60, 254-271.	CBS 221.30	Thom, C. (1906). Fungi in cheese ripening; Camembert and Roquefort. Bull. Bur. Anim. Ind. US Dep. Agric. 82, 33.
Fungi	*Ascomycota*	*Aspergillaceae*	*Penicillium*	*Penicillium salamii*		Meat	Magistà, D., Ferrara, M., Del Nobile, M.A., Gammariello, D., Conte, A., Perrone, G. (2016). A new promising fungal starter for salami production. Int J Food Microbiol Aug 16;231:33-41. doi: 10.1016/j.ijfoodmicro.2016.04.029. Epub 2016 Apr 27. Penicillium salamii strain ITEM 15302:	CBS 135391	Perrone, G. et al. (2015). Penicillium salamii, a new species occuring during seasoning of dry-cured meat International, International journal of food microbiology 193 (2015) 91-98.
Fungi	*Ascomycota*	*Aspergillaceae*	*Penicillium*	*Penicillium salamii*		Meat	Magista, D. et al. (2016). Penicillium salamii strain ITEM15302 : a new promising fungal staer for salami production, International journal of food microbiology 231, 33-41.	CBS 135391	Perrone, G. et al. (2015). Penicillium salamii, a new species occuring during seasoning of dry-cured meatInternational, International journal of food microbiology 193 (2015) 91-98.
Fungi	*Ascomycota*	*Aspergillaceae*	*Penicillium*	*Penicillium solitum*		Meat	Frisvad, J.C., Smedsgaard, J., Larsen, T.O., Samson, R.A. (2004). Mycotoxins, drugs and other extrolites produced by species in Penicillium subgenus Penicillium. Stud. Mycol., 49, 201-241.	CBS 288.36	Westling, R. (1911). Über die grünen Spezies der Gattung Penicillium Journal: Arkiv før Botanik 11, 1-156.
Fungi	*Ascomycota*	*Cordycipitaceae*	*Akanthomyces*	*Akanthomyces lecanii*		Dairy	Lund, F., Filtenborg, O., Frisvad, J.C. (1995). Associated mycoflora of cheese. Food Microbiology 12, 173-180.	CBS 102067	Kepler, R.M., Jennifer, L.A.J., Hywel-Jones, N.L., Alisha, Q.C., Gi-Ho, S. & Rehner, S.A. et al. (2017). A phylogenetically-based nomenclature for cordycipitaceae (hypocreales). Ima Fungus, 8(2), 335-353.
Fungi	*Ascomycota*	*Debaryomycetaceae*	*Meyerozyma*	*Meyerozyma guilliermondii*		Plant Based	Thin Thin, W., Supawan, W., Apinya, A. et al. (2013). Co-culturing of Pichia guilliermondii enhanced volatile flavor compound formation by Zygosaccharomyces rouxii in the model system of Thai soy sauce fermentation.[J]. International Journal of Food Microbiology, 2013, 160(3):282-9.	CBS 2030	Kurtzman, C.P., Suzuk, M. (2010). Phylogenetic analysis of ascomycete yeasts that form coenzyme Q-9 and the proposalof the new genera Babjeviella, Meyerozyma, Millerozyma, Priceomyces, and Scheffersomyces. Mycoscience January 2010, Volume 51, Issue 1, pp 2-14
Fungi	*Ascomycota*	*Dipodascaceae*	*Geotrichum*	*Geotrichum candidum*		Dairy	Mounier, J., Monnet, C., Vallaeys, T., Arditi, R., Sarthou, A.S., Hélias, A., Irlinger, F. (2008). Microbial interactions within a cheese microbial community. Appl Environ Microbiol. 74, 172-81 Gueguen, M., Lenoir, J. (1975). Aptitude de l'espèce Geotrichum candidum à la production d'enzymes protéolytiques. Le Lait 55 (543-544) 145-162	CBS 178.71	De Hoog, G.S., Smith, M.T. (2004). Ribosomal gene phylogeny and species delimitation in Geotrichum and its teleomorphs. Stud Mycol 50, 489–515.
Fungi	*Ascomycota*	*Dipodascaceae*	*Geotrichum*	*Geotrichum candidum*		Meat	Castellari, C., Quadrelli, A.M., Laich, F. (2010). Surface mycobiota on Argentinean dry fermented sausages. Int J Food Microbiol. 142, 149-55	CBS 178.71	De Hoog, G.S., Smith, M.T. (2004). Ribosomal gene phylogeny and species delimitation in Geotrichum and its teleomorphs. Stud Mycol 50, 489–515.
Fungi	*Ascomycota*	*Dipodascaceae*	*Geotrichum*	*Geotrichum fragrans*		Dairy	Marcellino, N., Beuvier, E., Grappin, R., Gueguen, M., Benson, D.R. (2001). Diversity of Geotrichum candidum Strains Isolated from Traditional Cheesemaking Fabrications in France Applied and Environmental Microbiology, Oct. 2001, p. 4752–4759	CBS 152.25	Alper, I., Frenette, M., Labrie, S. (2011). Fungal biology 115, 1259-1269, 10 September 2011 Ribosomal DNA polymorphisms in the yeast Geotrichum candidum

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Fungi	*Ascomycota*	*Dipodascaceae*	*Yarrowia*	*Yarrowia lipolytica*		Dairy	Gkatzionis, K., Hewson, L., Hollowood, T., Hort, J., Christie E.R., Linforth, R.S.T. (2013). Effect of Yarrowia lipolytica on blue cheese odour development: Flash profile sensory evaluation of microbiological models and cheeses. International Dairy Journal, Volume 30, Issue 1, May 2013, Pages 8-13	CBS 6124	Van de Walt, J.P., Von Arx, J.A. (1980). The yeast genus Yarrowia gen. nov. Antonie van Leeuwenhoek 46, 517-521.
Fungi	*Ascomycota*	*Dipodascaceae*	*Yarrowia*	*Yarrowia lipolytica*		Dairy	Boekhout, T., Robert, V., (Eds.). (2003). Yeasts in food: Beneficial and detrimental aspects. Behr's Verlag, Hamburg.	CBS 6124	Van de Walt, J.P., Von Arx, J.A. (1980). The yeast genus Yarrowia gen. nov. Antonie van Leeuwenhoek 46, 517-521.
Fungi	*Ascomycota*	*Incertae sedis*	*Diutina*	*Diutina rugosa*		Dairy	Seiler, H., Busse, M. (1990). The yeasts of cheese brines. Int J Food Microbiol. 11(3-4):289-303.	CBS 613	Khunnamwong, P., Lertwattanasakul, N., Jindamorakot, S., Limtong, S., Lachance, M-A. (2015). Description of diutina gen. nov. diutina siamensis, f.a. sp. nov. and reassignment of candida catenulata, candida mesorugosa, candida neorugosa, candida pseudorugosa, candida ranongensis, candida rugosa and candida scorzettiae to the genus diutina. International Journal of Systematic & Evolutionary Microbiology, 65(12), 4701.
Fungi	*Ascomycota*	*Incertae sedis*	*Starmerella*	*Starmerella etchellsii*		Plant Based	Coton, E., Coton, M., Levert, D., Casaregola, S., Sohier, D. (2006). Yeast ecology in French cider and black olive natural fermentations. Int J Food Microbiol. Apr 15;108(1):130-5.	CBS 1750	Santos, A.R.O., Leon, M.P., Barros, K.O., Freitas, L.F.D., Rosa, C.A. (2018). Starmerella camargoi f.a. sp. nov. starmerella ilheusensis f.a. sp. nov. starmerella litoralis f.a. sp. nov. starmerella opuntiae f.a. sp. nov. starmerella roubikii f.a. sp. nov. and starmerella vitae f.a. sp. nov. isolated from flowers and bees, and transfer of related candida species to the genus starmerella as new combinations. International Journal of Systematic and Evolutionary Microbiology, 68(4).
Fungi	*Ascomycota*	*Incertae sedis*	*Starmerella*	*Starmerella stellata*		Alcoholic Beverages	Charoenchai, C., Fleet, G.H., Henschke, P.A., Todd, B.E.N. (1997). Screening of non-Saccharomyces wine yeasts for the presence of extracellular hydrolytic enzymes, Australian Journal of Grape and Wine Research Vol. 3,p. 2-9	ATCC 10673 - CBS 157	Santos, A.R.O., Leon, M.P., Barros, K.O., Freitas, L.F.D., Rosa, C.A. (2018). Starmerella camargoi f.a. sp. nov. starmerella ilheusensis f.a. sp. nov. starmerella litoralis f.a. sp. nov. starmerella opuntiae f.a. sp. nov. starmerella roubikii f.a. sp. nov. and starmerella vitae f.a. sp. nov. isolated from flowers and bees, and transfer of related candida species to the genus starmerella as new combinations. International Journal of Systematic and Evolutionary Microbiology, 68(4).
Fungi	*Ascomycota*	*Microascaceae*	*Scopulariopsis*	*Scopulariopsis flava*		Dairy	Ropars, J., Cruaud, C., Lacoste, S., Dupont, J. (2012). Int J Food Microbiol. 2012. Apr 16;155(3):199-210. A taxonomic and ecological overview of cheese fungi.	CBS 207.61	Morton, F.J., Smith, G. (1963). Mycological Papers 86: 1-96.
Fungi	*Ascomycota*	*Microascaceae*	*Scopulariopsis*	*Scopulariopsis flava*		Dairy	Spotti, E., Berni, E., Cacchioli, C. (2008). Characteristics and Applications of Molds. Meat Biotechnology Part II, 181-195 Moreau, C., 1979. Nomenclature des Penicillium utiles à la préparation du Camembert. Lait 59 219-233	CBS 207.61	Morton, F.J., Smith, G. (1963). Mycological Papers 86: 1-96.
Fungi	*Ascomycota*	*Nectriaceae*	*Bisifusarium*	*Bisifusarium domesticum*		Dairy	Ratomahenina, R., Van den Booms, S., Galzy, P., Dieu, B. (1995). Study of growth parameters of Cylindrocarpon sp., a mould isolated from saint nectaire cheese. Chem Mikrobiol Technol Lebens 17, 169-171.	CBS 434.34	Lombard, L., van der Merwe, N.A. et al. (2015). Generic concepts in nectriaceae - sciencedirect. Studies in Mycology, 80(80), 189-245.
Fungi	*Ascomycota*	*Nectriaceae*	*Fusarium*	*Fusarium venenatum*		Dairy	Thrane, U. (2007). Fungal protein for food. In: Dijksterhuis, J., Samson., R.A. (Eds.), Food Mycology. A multifaceted approach to fungi and food. CRC Press, Boca Raton, pp. 353-360.	CBS 458.93	Nirenberg, H.I. (1995). Morphological differentiation of Fusarium sambucinum Fuckel sensu stricto, F. torulosum (Berk. & Curt.) Nirenberg comb. nov. and F. venenatum Nirenberg sp. nov. Mycopathologia 129, 131-141.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Candida*	*Candida intermedia*		Dairy	Nahabieh, F. and Schmidt, J.L. (1990). Study of the yeast flora composition of some wide varieties of goat cheese. Lait. 70, 325-343.	CBS 572	Langeron, M., Guerra, P. (1938). Nouvelles recherches de zymologie médicale. Annales de Parasitologie Humaine Comparée. 16(5):429-476
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Candida*	*Candida mogii*		Plant Based	Chen, X., Yan, M., Xie, F., Dai, J., Li, D. & Wang, Z. et al. (2014). Biotin enhances salt tolerance of torulopsis mogii. Annals of Microbiology, 65(1), 393-398.	CBS 5713	Kurtzman, C.P., Fell, J.W., Boekhout, T., Robert, V. (2011). Methods for isolation, phenotypic characterization and maintenance of yeasts. In: Fell JW, Boekhout T (eds) The Yeasts, A Taxonomic Study (Kurtzman CP, 5th edn. Elsevier, Amsterdam, pp 987-1278.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Candida*	*Candida oleophila*		Alcoholic Beverages	Droby, S., Cohen, L., Davis, A., Weiss, B., Hores, B., Chalutz, E., Kotz, H., Kerantzur, M., Shachnai, A. (1998). Commercial testing of Aspire: a yeast preparation for the biological control of postharvest decay of citrus. Biol. Control 12, 97-101	CBS 2219	Montrocher, R. (1967). Quelques nouvelles espèces et variétés du genre Candida (Levures asporogènes). Rev Mycol 32 69-92
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Candida*	*Candida sake*		Dairy	Nahabieh, F. and Schmidt, J.L. (1990). Study of the yeast flora composition of some wide varieties of goat cheese. Lait. 70, 325-343.	CBS 159	Meyer, S.A., Ahearn, D.G. (1983): Validation of the names of some Candida species. Mycotaxon 17: 297-298
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Candida*	*Candida tropicalis*		Plant Based	Coulin, P., Farah, Z., Assanvo, J., Spillmann, H., Puhan, Z. (2006). Characterisation of the microflora of attiéké, a fermented cassava product, during traditional small-scale preparation. Int J Food Microbiol 106 131–6	ATCC 4563	Berkhout, C.M. (1923). De schimmelgeslachten Monilia, Oidium, Oospora en Torula: 44
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Candida*	*Candida zemplinina*		Alcoholic Beverages	Urso, R., Rantsiou, K., Dolci Rolle, L., Comi, G., Cocolin, L. (2008). Yeast biodiversity and dynamics during sweet wine production as determined by molecular methods. FEMS Yeast Res 8 1053–1062	CBS 9494	Sipiczki, M. (2003). Candida zemplinina sp. nov., an osmotolerant and psychrotolerant yeast that ferments sweet botrytized wines. Int J System Evol Microbiol 53: 2079–2083.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Candida*	*Candida zeylanoides*		Dairy	Seiler, H., Busse, M. (1990). The yeasts of cheese brines. Int. J. Food Microbiol., 11(3-4), 289-303	ATCC 20356	Tsui, T.H.M., Daniel, H.M., Robert, V., Meyer, W. (2008). Re-examining the phylogenyof clinically relevant Candida species and allied genera based on multigene analyses. FEMS Yeast Res 8 651–659 Kurtzman, C.P., Suzuki, M. (2010). Phylogenetic analysis of ascomycete yeasts that form coenzyme Q-9 and the proposal of the new genera Babjeviella, Meyerozyma, Millerozyma, Priceomyces, and Scheffersomyces. Mycoscience 51, 2-14
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Cyberlindnera*	*Cyberlindnera jadinii*		Dairy	Thrane, U. (2007). Fungal protein for food. In: Dijksterhuis, J., Samson, R.A. (Eds.), Food Mycology. A multifaceted approach to fungi and food. CRC Press, Boca Raton, pp. 353-360.	CBS 5609	Minter, D.W. (2009). Cyberlindnera, a replacement name for Lindnera Kurtzman et al., nom. illegit. Mycotaxon. 110, 473-476.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Cyberlindnera*	*Cyberlindnera mrakii*		Alcoholic Beverages	Erten, H., Tanguler, H. (2010). Influence of Williopsis saturnus yeasts in combination with Saccharomyces cerevisiae on wine fermentation. Lett Appl Microbiol. 50, 474-9.	CBS 1707	Kurtzman, C.P., Robnett, C.J. (2010). Systematics of methanol assimilating yeasts and neighboring taxa from multigene sequence analysis and the proposal of Peterozyma gen. nov., a new member of the Saccharomycetales. FEMS Yeast Res. 10, 353-61.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Debaryomyces*	*Debaryomyces hansenii*		Dairy	Geronikou, A., Srimahaeak, T., Rantsiou, K., Triantafillidis, G., Larsen, N., Jespersen, L. (2020). Occurrence of Yeasts in White-Brined Cheeses: Methodologies for Identification, Spoilage Potential and Good Manufacturing Practices. Front Microbiol. Oct 15;11:582778. doi: 10.3389/fmicb.2020.582778. PMID: 33178163; PMCID: PMC7593773.	CBS 767	Jacques, N., Mallet, S., Casaregola, S. (2009). Delimitation of the species of the Debaryomyces hansenii complex by intron sequence analysis. Int J Syst Evol Microbiol. 59(Pt 5), 1242-51
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Debaryomyces*	*Debaryomyces hansenii*		Plant Based	Arroyo-López, F.N., Querol, A., Bautista-Gallego, J., Garrido-Fernández, A. (2008). Role of yeasts in table olive production. Int J Food Microbiol. Dec 10;128(2):189-96. doi: 10.1016/j.ijfoodmicro.2008.08.018. Epub 2008 Sep 5. PMID: 18835502.	CBS 767	Jacques, N., Mallet, S., Casaregola, S. (2009). Delimitation of the species of the Debaryomyces hansenii complex by intron sequence analysis. Int J Syst Evol Microbiol. 59(Pt 5), 1242-51

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Debaryomyces*	*Debaryomyces hansenii*		Meat	Laranjo, M., Potes, M.E., Elias, M. (2019). Role of Starter Cultures on the Safety of Fermented Meat Products. Front Microbiol. 2019 Apr 26;10:853. doi: 10.3389/fmicb.2019.00853. PMID: 31133993; PMCID: PMC6524729.	CBS 767	Jacques, N., Mallet, S., Casaregola, S. (2009). Delimitation of the species of the Debaryomyces hansenii complex by intron sequence analysis. Int J Syst Evol Microbiol. 59(Pt 5), 1242-51
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Debaryomyces*	*Debaryomyces hansenii*		Alcoholic Beverages	Charoenchai, C., Fleet, G.H., Henschke, P.A., Todd, B.E.N. (1997). Screening of non-Saccharomyces wine yeasts for the presence of extracellular hydrolytic enzymes, Australian Journal of Grape and Wine Research Vol. 3,p. 2-9	CBS 767	Jacques, N., Mallet, S., Casaregola, S., (2009). Delimitation of the species of the Debaryomyces hansenii complex by intron sequence analysis. Int J Syst Evol Microbiol. 59(Pt 5), 1242-51
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Dekkera*	*Dekkera bruxellensis*		Alcoholic Beverages	Boekhout, T., Robert, V. (Eds.). (2003). Yeasts in food: Beneficial and detrimental aspects. Behr's Verlag, Hamburg.	CBS 74	Van der Walt, J.P. (1964). Dekkera, a new genus of the Saccharomycetaceae. Antonie van Leeuwenhoek 30, 273-280.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Dekkera*	*Dekkera claussenii*		Plant Based	Jayabalan, R., Malbasa, R.V., Loncar, E.S., Vitas, J.S. and Sathishkumar, M. (2014). A Review on Kombucha Tea—Microbiology, Composition, Fermentation, Beneficial Effects, Toxicity, and Tea Fungus. Comprehensive Reviews in Food Science and Food Safety Vol. 13	ATCC 10562	Roder, C., Konig, H., Frohlich, J. (2007). Species-specific identification of Dekkera/ Brettanomyces yeasts by fluorescently labeled DNA probes targeting the 26S rRNA FEMS Yeast Res 7(6), 1013-1026.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Diutina*	*Diutina catenulata*		Dairy	Roostita, R., Fleet, G.H. (1996). The occurrence and growth of yeasts in Camembert and blue-veined cheeses. Int. J. Food Microbiol. Vol 28. 393-404	CBS 565	Khunnamwong, P., Lertwattanasakul, N., Jindamorakot, S., Limtong, S. and Lachance, M.A. (2015). Description of Diutina gen. Nov., Diutina siamensis, f.a. sp. Nov. and reassignment of Candida catenulata, Candida mesorugosa, Candida neorugosa, Candida pseudorugosa, Candida ranongensis, Candida rugosa and Candida scorzettiae to the genus Diutina. Int. J. Syst. Evol. Microbiol. 65, 4701-4709. - Diddens, H.A., & Lodder, J., 1942
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Hanseniaspora*	*Hanseniaspora guilliermondii*		Alcoholic Beverages	Moreira, N., Mendes, F., Guedes de Pinho, P., Hogg, T., Vasconcelos, I. (2008). Heavy sulphur compounds, higher alcohols and esters production profile of Hanseniaspora uvarum and Hanseniaspora guilliermondii grown as a pure and mixed cultures in grape must. Int J Food Microbiol 124: 231–238.	CBS 465	Pijper, A. (1928). [A new Hanseniaspora] Verhandelingen, Koninklijke Nederlandse Akademie van Wetenschappen, Afdeling Natuurkunde 37 868-871
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Hanseniaspora*	*Hanseniaspora osmophila*		Alcoholic Beverages	Viana, F., Gil, J.V., Genovés, S., Vallés, S., Manzanares, P. (2008). Rational selection of non-Saccharomyces wine yeasts for mixed starters based on ester formation and enological traits. Food Microbiol 25: 778–785.	CBS 313	Phaff, H.J., Miller, M.W., Shifrine, M. (1956). The taxonomy of yeasts isolated from Drosophila in the Yosemite region of California. Antonie van Leeuwenhoek 22 145-161
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Hanseniaspora*	*Hanseniaspora uvarum*		Alcoholic Beverages	Moreira, N., Mendes, F., Guedes de Pinho, P., Hogg, T., Vasconcelos, I. (2008). Heavy sulphur compounds, higher alcohols and esters production profile of Hanseniaspora uvarum and Hanseniaspora guilliermondii grown as a pure and mixed cultures in grape must. Int J Food Microbiol 124: 231–238.	CBS 314	Kreger-van Rij, N.J.W. (1984). The Yeasts: a taxonomic study Edition#3 1-1082
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Kazachstania*	*Kazachstania africana*		Plant Based	Jayabalan, R., Malbasa, R.V., Loncar, E.S., Vitas, J.S. and Sathishkumar, M. (2014). A Review on Kombucha Tea—Microbiology, Composition, Fermentation, Beneficial Effects, Toxicity, and Tea Fungus. Comprehensive Reviews in Food Science and Food Safety Vol. 13	ATCC 22294	Kurtzman, C.P., Fell, J.W., Boekhout, T. (2011). The Yeasts: A Taxonomic Study, 5th edition. 3 Vol. Amsterdam: Elsevier Science & Technology.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Kazachstania*	*Kazachstania exigua*		Dairy	Zhou, J., Liu, X., Jiang, H., Dong, M. (2009). Analysis of the microflora in Tibetan kefir grains using denaturing gradient gel electrophoresis. Food Microbiol. 26, 770-5.	CBS 379	Kurtzman, C.P., Robnett, C.J. (2003). Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses. FEMS Yeast Res. 3, 417-32. Kurtzman, C.P. (2003). Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Kazachstania*	*Kazachstania exigua*		Bakery	Ottogalli, G., Galli, A., Foschino, R. (1996). Italian bakery products obtained with sourdough : Characterization of the typical microflora. Advances in food sciences 18, 131-144.	CBS 379	Kurtzman, C.P., Robnett, C.J. (2003). Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses. FEMS Yeast Res. 3, 417-32. Kurtzman, C.P. (2003). Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Kazachstania*	*Kazachstania humilis*		Bakery	Valmorri, S. (2010). Yeast microbiota associated with spontaneous sourdough fermentations in the production of traditional wheat sourdough breads of the Abruzzo region (Italy). Antonie Van Leeuwenhoek 97(2):119-29.	CBS 5658	Jacques, N., Sarilar, V., Urien, C., Lopes, M.R., Morais, C.G. & Uetanabaro, A.P.T. et al. (2016). Three novel ascomycetous yeast species of the kazachstania clade, kazachstania saulgeensis sp nov. kazachstania serrabonitensis sp nov and kazachstania australis sp nov reassignment of candida humilis to kazachstania humilis f.a. comb. nov and candida pseudohumilis to kazachstania pseudohumilis f.a. comb. nov. Int. J. Syst. Evol. Microbiology., 66(12), 5192-5200.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Kazachstania*	*Kazachstania unispora*		Dairy	Zhou, J., Liu, X., Jiang, H., Dong, M. (2009). Analysis of the microflora in Tibetan kefir grains using denaturing gradient gel electrophoresis. Food Microbiol. 26, 770-5. Wang, S.Y., Chen, H.C., Liu, J.R., Lin, Y.C., Chen, M.J. (2008). Identification of Yeasts and Evaluation of their Distribution in Taiwanese Kefir and Viili Starters. J Dairy Sci. 91, 3798-3805.	CBS 398	Kurtzman, C.P., Robnett, C.J. (2003). Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses. FEMS Yeast Res. 3, 417-32. Kurtzman, C.P. (2003). Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Kluyveromyces*	*Kluyveromyces lactis*		Dairy	Roostita, R., Fleet, G.H. (1996). The occurrence and growth of yeasts in Camembert and Blue-veined cheeses. Int. J. Food Micorbiol. 28, 393-404. Dujon, B. et al. (2004). Genome evolution in yeasts. Nature 430, 35-44.	CBS 683	Kurtzman, C.P., Robnett, C.J. (2003). Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses. FEMS Yeast Res. 3, 417-32. Kurtzman, C.P. (2003). Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Kluyveromyces*	*Kluyveromyces marxianus*		Dairy	Roostita, R., Fleet, G.H. (1996). The occurrence and growth of yeasts in Camembert and Blue-veined cheeses. Int. J. Food Micorbiol. 28, 393-404.	CBS 712	Kurtzman, C.P., Robnett, C.J. (2003). Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses. FEMS Yeast Res. 3, 417-32. Kurtzman, C.P. (2003). Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Lachancea*	*Lachancea fermentati*		Alcoholic Beverages	Romano, P., Suzzi, G., Domizio, P., Fatichenti, F. (1997). Secondary products formation as a tool for discriminating non-Saccharomyces wine strains. Strain diversity in non-Saccharomyces wine yeasts. Antonie Van Leeuwenhoek. 71(3):239-42.	CBS 707	Kurtzman, CP. (2003). Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res 4 233-245.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Lachancea*	*Lachancea thermotolerans*		Alcoholic Beverages	Pando, I., Garcia, M.J., Zuniga, M., Uruburu, F. (1989). Dynamics of Microbial Populations during Fermentation of Wines from the Utiel-Requena Region of Spain. App Env Microbiol 539-541 Gonzalez, S.S., Barrio, E., Querol, A. (2007). Molecular identification and characterization of wine yeasts isolated from Tenerife. J Appl Microbiolo 102 1018-1025.	CBS 6340	Jacquier, A., Dujon, B. (1983). The intron of the mitochondrial 21S rRNA gene: distribution in different yeast species and sequence comparison between Kluyveromyces thermotolerans and Saccharomyces cerevisiae. Mol Gen Genet 192(3):487-99.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Metschnikowia*	*Metschnikowia pulcherrima*		Alcoholic Beverages	Charoenchai, C., Fleet, G.H., Henscke, P.A., Todd, B.E.N. (1997). Screening of non-Saccharomyces wine yeasts for the presene of extracellular hydrolytic enzymes. Aust. J. grape Wine Res. 3, 2-8	CBS 610	Kurtzman, C.P., Fell, J.W., Boekhout, T. (2011). The Yeasts: A Taxonomic Study, 5th edition. 3 Vol. Amsterdam: Elsevier Science & Technology.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia anomala*		Alcoholic Beverages	Larroque, M.N., Carrau, F., Fariña, L., Boido, E., Dellacassa, E., Medina, K. (2020). Effect of Saccharomyces and non-Saccharomyces native yeasts on beer aroma compounds. Int J Food Microbiol2021 Jan 16;337:108953. doi: 10.1016/j.ijfoodmicro.2020.108953. Epub 2020 Nov 4	MB#530461 CBS 104	Hanseniaspora uvarum (Niehaus). (1984). Published in Shehata, Mrak & Phaff ex M.T. Sm. The Yeasts: a taxonomic study: 159 Originates from Hansens culture No. 27 of 13 May 1886
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia anomala*		Alcoholic Beverages	Charoenchai, C., Fleet, G.H., Henschke, P.A., Todd, B.E.N. (1997). Screening of non-Saccharomyces wine yeasts for the presence of extracellular hydrolytic enzymes, Australian Journal of Grape and Wine Research Vol. 3,p. 2-9	MB#530461 CBS 104	Hanseniaspora uvarum (Niehaus). (1984). Published in Shehata, Mrak & Phaff ex M.T. Sm. The Yeasts: a taxonomic study: 159 Originates from Hansens culture No. 27 of 13 May 1886
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia fermentans*		Dairy	Jun-Jun Yang, Chun-Feng Guo, Wu-Peng Ge, Qian-Ning Wang, Yue Zhang, Ying Chen, Jing Yang, Yuan Ma, Ya-Juan Yuan & Li-Hu Qin. (2014). Isolation and identification of yeast in yak milk dreg of Tibet in China. Dairy Science & Technology volume 94, pages 455–467	CBS 187	Kurtzman, C.P., Robnett, C.J. (2003). Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses.FEMS Yeast Res. 3, 417-32. Kurtzman, C.P. (2003). Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia fermentans*		Dairy	Qing, M., Bai, M., Zhang, Y., Liu, W., Sun, Z., Zhang, H., Sun, T. (2010). Identification and biodiversity of yeasts from Qula in Tibet and milk cake in Yunnan of China. Wei Sheng Wu Xue Bao. 50, 1141-6. + 4 more ref.	CBS 187	Kurtzman, C.P., Robnett, C.J. (2003). Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses.FEMS Yeast Res. 3, 417-32. Kurtzman, C.P. (2003). Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia fermentans*		Alcoholic Beverages	Bokulich, N.A., Bamforth, C. W. , Mills, D.A. (2012). Brewhouse-Resident Microbiota Are Responsible for Multi-Stage Fermentation of American Coolship Ale. PLoS ONE doi:10.1371/journal.pone.0035507	CBS 187	Kurtzman, C.P., Robnett, C.J. (2003). Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses.FEMS Yeast Res. 3, 417-32. Kurtzman, C.P. (2003). Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia kluyverii*		Alcoholic Beverages	Oliveira, I., Ferreira, V. (2019). Modulating Fermentative, Varietal and Aging Aromas of Wine Using non- Saccharomyces Yeasts in a Sequential Inoculation Approach. Microorganisms Jun 6;7(6):164. doi: 10.3390/microorganisms 7060164.	CBS 188	Kurtzman, C.P., Robnett, C.J. (1999). Identification and phylogeny of ascomycetous yeasts from analysis of nuclear large subunit (26S) ribosomal DNA partial sequences. Antonie van Leeuwenhoek 73, 331-71

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia kluyverii*		Alcoholic Beverages	Bokulich, N.A., Bamforth, C.W. , Mills, D.A. (2012). Brewhouse-Resident Microbiota Are Responsible for Multi-Stage Fermentation of American Coolship Ale. PLoS ONE doi:10.1371/journal.pone.0035507 N'guessan, K.F., Brou, K., Jacques, N., Casaregola, S., Dje, K.M. (2011). Identification of yeast during alcoholic fermentation of tchapalo, a traditional sorghum beer from Côte d 'Ivoire. Antonie van LLeeuwenhoek 99, 855-864 DOI 10.1007/s 10482-011-9560-7	CBS 188	Kurtzman, C.P., Robnett, C.J. (1999). Identification and phylogeny of ascomycetous yeasts from analysis of nuclear large subunit (26S) ribosomal DNA partial sequences. Antonie van Leeuwenhoek 73, 331-71
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia kluyverii*		Alcoholic Beverages	Pardo, I., Garcia, M.J., Zuniga, M., Uruburu, F. (1989). Dynamics of Microbial Populations during Fermentation of Wines from the Utiel-Requena Region of Spain. App Env Micro 539-541. Fleet, G.H., Lafon-Lafourcade, S. and Ribéreau-Gayon, P. (1984). Evolution of yeasts and lactic acid bacteria during fermentation and storage of Bordeaux wines. Appl. Environ. Microbiol., 48, 1034-1038.	CBS 188	Kurtzman, C.P., Robnett, C.J. (1999). Identification and phylogeny of ascomycetous yeasts from analysis of nuclear large subunit (26S) ribosomal DNA partial sequences. Antonie van Leeuwenhoek 73, 331-71
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia kluyverii*		Plant Based	Aponte, M. (2010). Study of green Sicilian table olive fermentations through microbiological, chemical and sensory analyses. Food Microbiol., 27, 162-170.	CBS 188	Kurtzman, C.P., Robnett, C.J. (1999). Identification and phylogeny of ascomycetous yeasts from analysis of nuclear large subunit (26S) ribosomal DNA partial sequences. Antonie van Leeuwenhoek 73, 331-71
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia kudriavzevii*		Alcoholic Beverages	Koricha, A.D., Han, D.Y., Bacha, K., Bai, F.Y. (2020). Diversity and distribution of yeasts in indigenous fermented foods and beverages of Ethiopia. J Sci Food Agric Jul;100(9):3630-3638. doi: 10.1002/jsfa.10391. Epub 2020 May 3.	CBS 5147	Kurtzman, C.P., Robnett, C.J., Basehoar-Powers, E. (2008). Phylogenetic relationships among species of Pichia, Issatchenkia and Williopsis determined from multigene sequence analysis, and the proposal of Barnettozyma gen. nov., Lindnera gen. nov. and Wickerhamomyces gen. nov. FEMS Yeast Res. (6):939-54.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia kudriavzevii*		Dairy	Bai, M., Qing, M., Guo, Z., Zhang, Y., Chen, X., Bao, Q., Zhang, H., Sun, T.S. (2010). Occurrence and dominance of yeast species in naturally fermented milk from the Tibetan Plateau of China. Can J Microbiol. 56(9):707-14 El-Sharoud, W.M., Belloch, C., Peris, D., Querol, A. (2009). Molecular identification of yeasts associated with traditional Egyptian dairy products.J Food Sci. 74(7):M341-6.19	CBS 5147	Kurtzman, C.P., Robnett, C.J., Basehoar-Powers, E. (2008). Phylogenetic relationships among species of Pichia, Issatchenkia and Williopsis determined from multigene sequence analysis, and the proposal of Barnettozyma gen. nov., Lindnera gen. nov. and Wickerhamomyces gen. nov. FEMS Yeast Res. (6):939-54.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia kudriavzevii*		Plant Based	Daniel, H.M., Vrancken, G., Takrama, J.F., Camu, N., De Vos, P., De Vuyst, L. (2009). Yeast diversity of Ghanaian cocoa bean heap fermentations.FEMS Yeast Res. 9(5):774-83.	CBS 5147	Kurtzman, C.P., Robnett, C.J., Basehoar-Powers, E. (2008). Phylogenetic relationships among species of Pichia, Issatchenkia and Williopsis determined from multigene sequence analysis, and the proposal of Barnettozyma gen. nov., Lindnera gen. nov. and Wickerhamomyces gen. nov. FEMS Yeast Res. (6):939-54.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia kudriavzevii*		Plant Based	Osorio-Cadavid, E., Chaves-López, C., Tofalo, R., Paparella, A., Suzzi, G. (2008). Detection and identification of wild yeasts in Champús, a fermented Colombian maize beverage. Food Microbiol. 25(6):771-7 Padonou, W.S., Nielsen, D.S., Hounhouigan, J.D., Thorsen, L., Nago, M.C., Jakobsen, M. (2009). The microbiota of Lafun, an African traditional cassava food product. Int J Food Microbiol. 133(1-2):22-30.	CBS 5147	Kurtzman, C.P., Robnett, C.J., Basehoar-Powers, E. (2008). Phylogenetic relationships among species of Pichia, Issatchenkia and Williopsis determined from multigene sequence analysis, and the proposal of Barnettozyma gen. nov., Lindnera gen. nov. and Wickerhamomyces gen. nov. FEMS Yeast Res. (6):939-54.

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Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia kudriavzevii*		Alcoholic Beverages	del Monaco, S.M., Barda, N.B., Rubio, N.C. and Caballero, A.C. (2014). Selection and characterization of a Patagonian Pichia kudriavzevii for wine deacidification, Journal of Applied Microbiology, Vol. 117, p. 415-464 Li, S.S., Cheng, C., Li, Z., Chen, J.Y., Yan, B., Han, B.Z., Reeves, M. (2010). Yeast species associated with wine grapes in China. Int J Food Microbiol 138(1-2):85-90	CBS 5147	Kurtzman, C.P., Robnett, C.J., Basehoar-Powers, E. (2008). Phylogenetic relationships among species of Pichia, Issatchenkia and Williopsis determined from multigene sequence analysis, and the proposal of Barnettozyma gen. nov., Lindnera gen. nov. and Wickerhamomyces gen. nov. FEMS Yeast Res. (6):939-54.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia membranifaciens*		Plant Based	Azi, Fi. Tu, C., Meng, L., Zhiyu, L., Cherinet, M.T., Ahmadullah, Z., Dong, M. (2021). Metabolite dynamics and phytochemistry of a soy whey-based beverage bio-transformed by water kefir consortium.Food Chem Apr 16;342:128225. doi: 10.1016/j. foodchem.2020.128225. Epub 2020 Sep 30.	CBS 107	Kurtzman, C.P., Robnett, C.J., Basehoar-Powers, E. (2008). Phylogenetic relationships among species of Pichia, Issatchenkia and Williopsis determined from multigene sequence analysis, and the proposal of Barnettozyma gen. nov., Lindnera gen. nov. and Wickerhamomyces gen. nov. FEMS Yeast Res. 8, 939-54.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia membranifaciens*		Dairy	Shepherd, R., Rockey, J., Sutherland, I.W., Roller, S. (1995). Novel bioemulsifiers from microorganisms for use in foods. J Biotechnol. 40, 207-217.	CBS 107	Kurtzman, C.P., Robnett, C.J., Basehoar-Powers, E. (2008). Phylogenetic relationships among species of Pichia, Issatchenkia and Williopsis determined from multigene sequence analysis, and the proposal of Barnettozyma gen. nov., Lindnera gen. nov. and Wickerhamomyces gen. nov. FEMS Yeast Res. 8, 939-54.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia norvegensis*		Dairy	Koslowskyb, S.G.M., Velagica, S., Borsta, N., Bockelmann, W., Hellerb, K.J., Schererac, S. (2011). Anti-listerial potential of food-borne yeasts in red smear cheese. International Dairy Journal Volume 21, Issue 2, February 2011, Pages 83-89	ATCC 58681	Leask, B.G.S., Yarrow, D. (1976). Sabouraudia. Mar;14(1):61-3. Pichia norvegensis sp. nov.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia norvegensis*		Plant Based	Osimani, A., Garofalo, C., Aquilanti, L., Milanović, V., Clementi, F. (2015). Unpasteurised commercial boza as a source of microbial diversity.Int J Food Microbiol. 2015 Feb 2;194:62-70.	ATCC 58681	Leask, B.G.S., Yarrow, D. (1976). Sabouraudia. Mar;14(1):61-3. Pichia norvegensis sp. nov.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia occidentalis*		Plant Based	Taheur, F.B., Mansour, C., Jeddou, K.B., Machreki, Y., Kouidhi, B., Abdulhakim, J.A., Chaieb, K. (2020). Aflatoxin B 1 degradation by microorganisms isolated from Kombucha culture. Toxicon May;179:76-83. doi: 10.1016/j.toxicon.2020.03.004. Epub 2020 Mar 17.	CBS 5459	Kurtzman, C.P., Robnett, C.J., Basehoar-Powers, E. (2008). Phylogenetic relationships among species of Pichia, Issatchenkia and Williopsis determined from multigene sequence analysis, and the proposal of Barnettozyma gen. nov., Lindnera gen. nov. and Wickerhamomyces gen. nov. FEMS Yeast Res. (6):939-54.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia occidentalis*		Dairy	Ongol, M.P., Asano, K. (2009). Main microorganisms involved in the fermentation of Ugandan ghee. Int J Food Microbiol. 133(3):286-91. Seiler, H., Busse, M., 1990. The yeasts of cheese brines. Int. J. Food Microbiol., 11(3-4), 289-303	CBS 5459	Kurtzman, C.P., Robnett, C.J., Basehoar-Powers, E. (2008). Phylogenetic relationships among species of Pichia, Issatchenkia and Williopsis determined from multigene sequence analysis, and the proposal of Barnettozyma gen. nov., Lindnera gen. nov. and Wickerhamomyces gen. nov. FEMS Yeast Res. (6):939-54.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Pichia*	*Pichia occidentalis*		Plant Based	Arroyo-López, F.N., Durán-Quintana, M.C., Ruiz-Barba, J.L., Querol, A., Garrido-Fernández, A. (2006). Use of molecular methods for the identification of yeast associated with table olives. Food Microbiol. (8):791-6.	CBS 5459	Kurtzman, C.P., Robnett, C.J., Basehoar-Powers, E. (2008). Phylogenetic relationships among species of Pichia, Issatchenkia and Williopsis determined from multigene sequence analysis, and the proposal of Barnettozyma gen. nov., Lindnera gen. nov. and Wickerhamomyces gen. nov. FEMS Yeast Res. (6):939-54.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Saccharomyces*	*Candida saitoana*		Plant Based	Soni, S.K., Sandhu, D.K., Vikhu, K.S., Karma, N. (1986). Microbiological studies on dosa fermentation. Food Microbiol 3: 45–53.	CBS 940	Kurtzman, C.P., Fell, J.W., Boekhout, T. (2011). The Yeasts, a Taxonomic Study [M]. United States of America, Fifth edition.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Saccharomyces*	*Saccharomyces bayanus*		Alcoholic Beverages	Rainieri, S., Kodama, Y., Kaneko, Y., Mikata, K., Nakao, Y. Ashikari, T. (2006). Pure and mixed genetic lines of Saccharomyces bayanus and Saccharomyces pastorianus and their contribution to the lager brewing strain genome. Appl Envir Microbiol 72, 3968-3974. Januszek, M., Satora, P., Wajda, L., Tarko, T. (2020). Saccharomyces bayanus Enhances Volatile Profile of Apple Brandies. Molecules Jul 8;25(14):3127.	CBS 395	Kurtzman, C.P., Robnett, C.J. (2003). Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses. FEMS Yeast Res. 3, 417-32. Kurtzman, C.P. (2003). Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Saccharomyces*	*Saccharomyces cerevisiae*		Dairy	Viljoen, B.C., Knox, A.M., De Jager, P.H., Lourens-Hattingh, A. (2003). Development of Yeast Populations during Processing and Ripening of Blue Veined Cheese. Food Technol. Biotechnol. 41 (4) 291–297.	CBS 1171	Kurtzman, C.P., Robnett, C.J. (2003). Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses. FEMS Yeast Res. 3, 417-32. Kurtzman, C.P. (2003). Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Saccharomyces*	*Saccharomyces cerevisiae*		Dairy	Roostita, R., Fleet, G.H. (1996). The occurrence and growth of yeasts in Camembert and Blue-veined cheeses. Int. J. Food Micorbiol. 28, 393-404.	CBS 1171	Kurtzman, C.P., Robnett, C.J. (2003). Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses. FEMS Yeast Res. 3, 417-32. Kurtzman, C.P. (2003). Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Saccharomyces*	*Saccharomyces cerevisiae*		Bakery	Lahue, C., Madden, A.A., Dunn, R.R., Smukowski Heil, C. (2020). History and Domestication of Saccharomyces cerevisiae in Bread Baking. Front Genet. Nov 11;11:584718. doi: 10.3389/fgene.2020.584718. PMID: 33262788; PMCID: PMC7686800.	CBS 1171	Kurtzman, C.P., Robnett, C.J. (2003). Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses. FEMS Yeast Res. 3, 417-32. Kurtzman, C.P. (2003). Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Saccharomyces*	*Saccharomyces cerevisiae*		Alcoholic Beverages	Krogerus, K., Gibson, B. (2020). A re-evaluation of diastatic Saccharomyces cerevisiae strains and their role in brewing. Appl Microbiol Biotechnol. May;104(9):3745-3756. doi: 10.1007/s00253-020-10531-0. Epub 2020 Mar 13. PMID: 32170387; PMCID: PMC7162825.	CBS 1171	Kurtzman, C.P., Robnett, C.J. (2003). Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses. FEMS Yeast Res. 3, 417-32. Kurtzman, C.P. (2003). Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Saccharomyces*	*Saccharomyces cerevisiae*		Alcoholic Beverages	Molina-Espeja, P. (2020). Next Generation Winemakers: Genetic Engineering in Saccharomyces cerevisiae for Trendy Challenges. Bioengineering (Basel). Oct 14;7(4):128. doi: 10.3390/bioengineering7040128. PMID: 33066502; PMCID: PMC7712467.	CBS 1171	Kurtzman, C.P., Robnett, C.J. (2003). Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses. FEMS Yeast Res. 3, 417-32. Kurtzman, C.P. (2003). Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Saccharomyces*	*Saccharomyces cerevisiae*		Plant Based	Annggriawan, R. (2017). Microbiological and food safety aspects of Tempeh prodcution in Indonesia. PhD thesis, Georg-August-University Göttingen, Germany.	CBS 1171	Kurtzman, C.P., Robnett, C.J. (2003). Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses. FEMS Yeast Res. 3, 417-32. Kurtzman, C.P. (2003). Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Saccharomyces*	*Saccharomyces cerevisiae*		Plant Based	FAO. (1998). Fermented fruits and vegetables: A global perspective-Chapter 2: Basic principles of fermentation. FAO Agricultural Services Bulletin No. 134.	CBS 1171	Kurtzman, C.P., Robnett, C.J. (2003). Phylogenetic relationships among yeasts of the 'Saccharomyces complex' determined from multigene sequence analyses. FEMS Yeast Res. 3, 417-32. Kurtzman, C.P. (2003). Phylogenetic circumscription of Saccharomyces, Kluyveromyces and other members of the Saccharomycetaceae, and the proposal of the new genera Lachancea, Nakaseomyces, Naumovia, Vanderwaltozyma and Zygotorulaspora. FEMS Yeast Res. 4, 233-45.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Saccharomyces*	*Saccharomyces pastorianus*		Alcoholic Beverages	Troianou, V., Toumpeki, C., Dorignac, E., Kogkou, C., Kallithraka, S, Kotseridis, Y. (2019). Evaluation of Saccharomyces pastorianus impact to Sauvignon blanc chemical & sensory profile compared to different strains of S. cerevisiae/bayanus. BIO Web Conf Volume 12. https://doi.org/10.10.1051/bioconf/20191202025	ATCC 12752	Dunn, B., Sherlock, G. (2008). Reconstruction of the genome origins and evolution of the hybrid lager yeast Saccharomyces pastorianus. Genome research 18.10: 1610-1623.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Saccharomyces*	*Saccharomyces pastorianus*		Alcoholic Beverages	Meier Dornberg, T., Hutzler, Michel, M., Methner, F.M., Jacob, F. (2017). The Importance of a Comparative Characterization of Saccharomyces Cerevisiae and Saccharomyces Pastorianus Strains for Brewing. Fermentation 3, 41; doi:10.3390	ATCC 12752	Dunn, B., Sherlock, G. (2008). Reconstruction of the genome origins and evolution of the hybrid lager yeast Saccharomyces pastorianus. Genome research 18.10: 1610-1623.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Saccharomyces*	*Saccharomyces pastorianus*		Plant Based	FAO. (1998). Fermented fruits and vegetables: A global perspective-Chapter 2: Basic principles of fermentation. FAO Agricultural Services Bulletin No. 134.	ATCC 12752	Dunn, B., Sherlock, G. (2008). Reconstruction of the genome origins and evolution of the hybrid lager yeast Saccharomyces pastorianus. Genome research 18.10: 1610-1623.

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Fungi	*Ascomycota*	*Saccharomycetaceae*	*Saccharomycoides*	*Saccharomycodes ludwigii*		Alcoholic Beverages	Adamenko, K., Kawa-Rygielska, J., Kucharska, A.Z. (2020). Characteristics of Cornelian cherry sour non-alcoholic beers brewed with the special yeast Saccharomycodes ludwigii. Food Chem May 15;312:125968. doi: 10.1016/j.foodchem.2019.125968. Epub 2019 Dec 9.	ATCC 11313	Hansen, E.C. (1904). Zentbl. Bakt. ParasitKde, Abt. II 12(19-21): 538.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Saccharomycoides*	*Saccharomycodes ludwigii*		Plant Based	Jayabalan, R., Malbasa, R.V., Loncar, E.S., Vitas, J.S. and Sathishkumar, M. (2014). A Review on Kombucha Tea—Microbiology, Composition, Fermentation, Beneficial Effects, Toxicity, and Tea Fungus. Comprehensive Reviews in Food Science and Food Safety Vol. 13	ATCC 11313	Hansen, E.C. (1904). Zentbl. Bakt. ParasitKde, Abt. II 12(19-21): 538.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Schwanniomyces*	*Schwanniomyces vanrijiae*		Alcoholic Beverages	Garcia, A., Carcel, C., Dalau, L., Samson, A., Aguera, E., Agosin, E., Gunata, Z. (2002). Influence of a mixed culture with Debaryomyces vanriji and Saccharomyces cerevisiae on the volatiles in a Muscat wine. J Food Sci 67: 1138–1143.	CBS 3024	Kurtzman, C.P., Suzuki, M. (2010). Phylogenetic analysis of ascomycete yeasts that form coenzyme Q-9 and the proposal of the new genera Babjeviella, Meyerozyma, Millerozyma, Priceomyces, and Scheffersomyces. Mycoscience 51: 2-14.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Starmerella*	*Starmerella bombicola*		Alcoholic Beverages	Ciani, M., Maccarelli, F. (1998). Oenological properties of non-Saccharomyces yeasts associated with winemaking. World J Microb Biot 14: 199–203.	CBS 6009	Rosa, C.A., Lachance, M.A. (1998). The yeast genus Starmerella gen. nov. and Starmerella bombicola comb. nov., the teleomorph of Candida bombicola (Spencer, Gorin et Tullock) Meyer et Yarrow. Int J Syst Evol Microbiol 48 1413-1417.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Trigonopsis*	*Trigonopsis cantarellii*		Alcoholic Beverages	Toro, M.E., Vazquez, F. (2002). Fermentation behaviour of controlled mixed and sequential cultures of Candida cantarellii and Saccharomyces cerevisiae wine yeasts. World J Microb Biot 18: 347–354.	ATCC 36588	Kurtzman, C.P., Robnett, C.J. (2007). Multigene phylogenetic analysis of theTrichomonascus , Wickerhamiella and Zygoascus yeast clades, and the proposal of Sugiyamaella gen.nov. and14 newspecies combinations. FEMS Yeast Res 7 141–151
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Wickerhamomyces*	*Wickerhamomyces anomalus*		Meat	Liu, Y., Wan, Z., Yohannes, K.W., Yu, Q.Q., Yang, Z., Hongyan, L., Liu, J., Wang, J. (2021). Functional Characteristics of Lactobacillus and Yeast Single Starter Cultures in the Ripening Process of Dry Fermented Sausage. Front Microbiol 8;11:611260.	CBS 5759	Kurtzman, C.P., Robnett, C.J., Basehoar-Powers, E. (2008). Phylogenetic relationships among species of Pichia, Issatchenkia and Williopsis determined from multigene sequence analysis, and the proposal of Barnettozyma gen. nov., Lindnera gen. nov. and Wickerhamomyces gen. nov. FEMS Yeast Res 8:939-54
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Wickerhamomyces*	*Wickerhamomyces anomalus*		Alcoholic Beverages	Kurita, O. (2008). Increase of acetate ester-hydrolysing esterase activity in mixed cultures of Saccharomyces cerevisiae and Pichia anomala. J Appl Microbiol 104: 1051–1058.	CBS 5759	Kurtzman, C.P., Robnett, C.J., Basehoar-Powers, E. (2008). Phylogenetic relationships among species of Pichia, Issatchenkia and Williopsis determined from multigene sequence analysis, and the proposal of Barnettozyma gen. nov., Lindnera gen. nov. and Wickerhamomyces gen. nov. FEMS Yeast Res 8:939-54
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Wickerhamomyces*	*Wickerhamomyces pijperi*		Alcoholic Beverages	Zagorc, T., Maraz, A., Cadez, N., Povhe Jemec, K., Peter, G., Resnik, M., Nemanic, J., Raspor, P. (2001). Indigenous wine killer yeast and therir application as a starter culture in wine fermentation. Food Micro. 2001, 18, 441-451	CBS 2887	Kurtzman, C.P., Robnett, C.J. & Basehoar-Powers, E. (2008). Phylogenetic relationships among species of pichia, issatchenkia and williopsis determined from multigene sequence analysis, and the proposal of barnettozyma gen. nov., lindnera gen. nov. and wickerhamomyces gen. nov.. Fems Yeast Research, 8(6), 939-954.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Zygosaccharomyces*	*Zygosaccharomyces bisporus*		Vinegar	Solieri, L. & Giudici, P. (2008). Yeasts associated to traditional balsamic vinegar: ecological and technological features. International Journal of Food Microbiology, 125(1), 36-45.	CBS 702	Kurtzman, C.P., Fell, J.W., Boekhout, T., Robert, V. (2011). Methods for isolation, phenotypic characterization and maintenance of yeasts. In: Fell JW, Boekhout T (eds) The Yeasts, A Taxonomic Study (Kurtzman CP, 5th edn. Elsevier, Amsterdam, pp 937-947.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Zygosaccharomyces*	*Zygosaccharomyces kombuchaensis*		Alcoholic Beverages	Bellut, K., Michel, M., Zarnkow, M., Hutzler, M., Jacob, F., De Schutter, D.P., Daenen, l., Lynch, K.M., Zannini, E., Arendt. E.K. (2018). Application of Non-Saccharomyces Yeasts Isolated from Kombucha in the Production of Alcohol-Free Beer. Fermentation 4(3), 66.	CBS 8849	Hulin, M., Wheals, A. (2014). Rapid identification of Zygosaccharomyces with genus-specific primers. Int J Food Microbiol. 2014 Mar 3;173:9-13.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Zygosaccharomyces*	*Zygosaccharomyces kombuchaensis*		Plant Based	Jayabalan, R., Malbasa, R.V., Loncar, E.S., Vitas, J.S. and Sathishkumar, M. (2014). A Review on Kombucha Tea—Microbiology, Composition, Fermentation, Beneficial Effects, Toxicity, and Tea Fungus. Comprehensive Reviews in Food Science and Food Safety Vol. 13	CBS 8849	Hulin, M., Wheals, A. (2014). Rapid identification of Zygosaccharomyces with genus-specific primers. Int J Food Microbiol. Mar 3;173:9-13.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Zygosaccharomyces*	*Zygosaccharomyces rouxii*		Plant Based	Dai, J., Li, K., Song, N., Yao, W., Xia, H., Yang, Q., Zhang, X., Li,X., Wang, Z., Yao, L., Yang, S., Chen, X. (2020). Zygosaccharomyces rouxii, an Aromatic Yeast Isolated From Chili Sauce, Is Able to Biosynthesize 2-Phenylethanol via the Shikimate or Ehrlich Pathways. Front Microbiol. 11: 597454.	CBS 732	Lodder, J. & Kreger-van Rij, N.J.W. (1984). The Yeast: a Taxonomie Study p.462
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Zygosaccharomyces*	*Zygosaccharomyces rouxii*		Plant Based	Hesseltine, C.W., Shibasaki, K. (1961). MisoIII. Pure Culture Fermentation with Saccharomyces rouxii. Appl Microbiol. 9: 515–518 Suezawa, Y., Suzuki, M., Mori, H. (2008). Genotyping of a Miso and Soy Sauce Fermentation Yeast, Zygosaccharomyces rouxii, Based on Sequence Analysis of the Partial 26S Ribosomal RNA Gene and Two Internal Transcribed Spacers, Biosci Biotechnol Biochem. 72:2452-5. Solieri, L., Giudici, P. (2008). Yeasts associated to Traditional Balsamic Vinegar: ecological and technological features. Int J Food Microbiol 125(1):36-45.	CBS 732	Lodder, J. & Kreger-van Rij, N.J.W. (1984). The Yeast: a Taxonomie Study p.462
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Zygotorulaspora*	*Zygotorulaspora florentina*		Alcoholic Beverages	Lencioni, L., Romani, C., Gobbi, M., Comitini, F., Ciani, M., Domizio, P. (2016). Controlled mixed fermentation at winery scale using Zygotorulaspora florentina and Saccharomyces cerevisiae. Int J Food Microbiol 2016 Oct 3;234:36-44.	CBS 746	Kurtzman, C.P., Fell, J.W., Boekhout, T. (2011). The Yeasts: A Taxonomic Study, 5th edition. 3 Vol. Amsterdam: Elsevier Science & Technology.
Fungi	*Ascomycota*	*Saccharomycetaceae*	*Zygotorulaspora*	*Zygotorulaspora florentina*		Dairy	Boekhout, T., Robert, V. (Eds.). (2003). Yeasts in food: Beneficial and detrimental aspects. Behr's Verlag, Hamburg.	CBS 647	Kurtzman, C.P., Fell, J.W., Boekhout, T. (2011). The Yeasts: A Taxonomic Study, 5th edition. 3 Vol. Amsterdam: Elsevier Science & Technology.
Fungi	*Ascomycota*	*Saccharomycopsidaceae*	*Saccharomycopsis*	*Saccharomycopsis fibuligera*		Vinegar	Dong, K.F., Na, A.N., Dong, L.L.I., Deng, H.S., Che, J.T., Samp. (2016). Isolation and identification of yeats in daqu for aged vinegar production and their capacity for producing ethly alcohol and ethly acetate. Science and Technology of Food Industry, 37(10): 213-216. (in Chinese) Chi, Z., Zhe, C., Liu, G., Wang, F., Ju, L., Tong, Z. (2009). Saccharomycopsis fibuligera and its applications in biotechnology [J]. Biotechnology Advances, 27(4): 423-431.	CBS 329.83	Kurtzman, C.P., Fell, J.W., Boekhout, T. (2011). The Yeasts: A Taxonomic Study, 5th edition. 3 Vol. Amsterdam: Elsevier Science & Technology
Fungi	*Ascomycota*	*Saccharomycopsidaceae*	*Saccharomycopsis*	*Saccharomycopsis fibuligera*		Alcoholic Beverages	Chang, S., Kzz, A., Xzc, A., Jgy, A. (2020). Effects of Saccharomycopsis fibuligera and Saccharomyces cerevisiae inoculation on small fermentation starters in Sichuan-style Xiaoqu liquor[J] .Food Res Int, 137: 109425. Sun, S., Zhai, L., Ling, X.U., Panpan, Y.U., X Bai, Yao, S. (2018). Application of Saccharomycopsis fibuligera CICC 33077 in the Production of High-Temperature Zhimaxiang Daqu. Liquor-Making Science & Technology, 289(07):76-82. (in Chinese)	CBS 329.83	Kurtzman, C.P., Fell, J.W., Boekhout, T. (2011). The Yeasts: A Taxonomic Study, 5th edition. 3 Vol. Amsterdam: Elsevier Science & Technology

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Fungi	*Ascomycota*	*Sarcosomataceae*	*Torulaspora*	*Torulaspora delbrueckii*		Alcoholic Beverages	Pando, I., Garcia, M.J., Zuniga, M., Uruburu, F. (1989). Dynamics of Microbial Populations during Fermentation of Wines from the Utiel-Requena Region of Spain. App. and Env. Microbiol. 539-541 Review Appl Microbiol Biotechnol 2018 Apr;102(7):3081-3094. The impact of Torulaspora delbrueckii yeast in winemaking. Santiago Benito 1	CLIB 230	Oda, Y., Yabuki, M., Tonomura, K., Fukunaga, M. (1997). Reexamination of Yeast Strains Classified as Torulaspora delbrueckii (Lindner). Int J Syst Bacteriol 47, 1102-1106
Fungi	*Ascomycota*	*Sarcosomataceae*	*Torulaspora*	*Torulaspora delbrueckii*		Dairy	Westall, S., Filreenborg ,O. (1998). Yeast occurance in Danish feta cheeses. Food Micro. 15, 215-222. Wyder, T.M., Spillmann, H., Puhan, Z., 1997. Investigation of yeast flora in dairy products. Food technol. biotechnol. 35, 4, 299-304.	CLIB 230	Oda, Y., Yabuki, M., Tonomura, K., Fukunaga, M. (1997). Reexamination of Yeast Strains Classified as Torulaspora delbrueckii (Lindner). Int J Syst Bacteriol 47, 1102-1106
Fungi	*Ascomycota*	*Schizosaccharomycetaceae*	*Schizosaccharomyces*	*Schizosaccharomyces pombe*		Alcoholic Beverages	Snow, P.G., Gallender, G.F. (1979). Deacidification of white table wines through partial fermentation by Schizosaccharomyces pombe. Am J Enol Viticult 30: 45–48.	CBS 356	Lindner, P. (1893). Schizosaccharomyces pombe n. sp., a new starter. Wochenschrift für Brauerei 10 1298-1300
Fungi	*Ascomycota*	*Sordariaceae*	*Neurospora*	*Neurospora sitophila*		Plant Based	Essers, A.J., Ebong, C., van der Grift, R.M., Nout, M.J., Otim-Nape, W., Rosling, H. (1995). Reducing cassava toxicity by heap-fermentation in Uganda. Int J Food Sci Nutr. 46(2):125-36.	CBS 381.50	Shear, G.L., Dodge, B.O. (1927). Life histories and heterothallism of the red bread-mold fungi of the Monilia sitophila group. J Agri Res 34(11) 1019-1041
Fungi	*Ascomycota*	*Trichomonascaceae*	*Blastobotrys*	*Blastobotrys adeninivorans*		Plant Based	Zhang, W., Yang, R., Fang, W., Yan, L., Lu, J., Sheng, J. (2016). Characterization of thermophilic fungal community associated with pile fermentation of Pu-erh tea.[J]. International journal of food microbiology,227.	CBS 8244	Kurtzman, C.P., Robnett, C.J. (2007). Multigene phylogenetic analysis of the Trichomonascus, Wickerhamiella and Zygoascus yeast clades, and the proposal of Sugiyamaella gen. nov. and 14 new species combinations.[J]. Fems Yeast Research, 7(1):141-151.
Fungi	*Ascomycota*	*Trichomonascaceae*	*Wickerhamiella*	*Wickerhamiella versatilis*		Dairy	Seiler, H., Busse, M. (1990). The yeasts of cheese brines. Int J Food Microbiol. 11:289-303	CBS 1752	Clara, De.V., Albaladejo, R.G., Guzmán, B., Steenhuisen, S-L., Johnson, S.D. & Herrera, C.M. et al. (2017). Flowers as a reservoir of yeast diversity: description of wickerhamiella nectarea f.a. sp. nov. and wickerhamiella natalensis f.a. sp. nov. from south african flowers and pollinators, and transfer of related candida species to the genus wickerhamiella as new combinations. Fems Yeast Research(5), 5.
Fungi	*Ascomycota*	*Trichomonascaceae*	*Wickerhamiella*	*Wickerhamiella versatilis*		Plant Based	van der Sluis, C., Mulder, A.N., Grolle, K.C., Engbers, G.H., ter Schure, E.G., Tramper, J., Wijffels, R.H. (2000). Immobilized soy-sauce yeasts: development and characterization of a new polyethylene-oxide support. J Biotechnol. 80:179-88. Suezawa ,Y., Suzuki, M. (2007). Bioconversion of Ferulic Acid to 4-Vinylguaiacol and 4-Ethylguaiacol and of 4-Vinylguaiacol to 4-Ethylguaiacol by Halotolerant Yeasts Belonging to the Genus Candida. Biosci Biotechnol Biochem. 71:1058-62	CBS 1752	Clara, De.V., Albaladejo, R.G., Guzmán, B., Steenhuisen, S-L., Johnson, S.D. & Herrera, C.M. et al. (2017). Flowers as a reservoir of yeast diversity: description of wickerhamiella nectarea f.a. sp. nov. and wickerhamiella natalensis f.a. sp. nov. from south african flowers and pollinators, and transfer of related candida species to the genus wickerhamiella as new combinations. Fems Yeast Research(5), 5.
Fungi	*Ascomycota*	*Wallemiaceae*	*Sporendonema*	*Sporendonema casei*		Meat	Scaramuzza, N., Diaferia, C., Berni, E. (2015). Monitoring the mycobiota of three plants manufacturing Culatello (a typical Italian meat product). Int J Food Micro. Volume 203, 16 June 2015, Pages 78-85.	CBS 355.29	Desmazières, J.B.H.J. (1827). Annales des Sciences Naturelles, Botanique 11: 246-249.
Fungi	*Ascomycota*	*Wallemiaceae*	*Sporendonema*	*Sporendonema casei*		Dairy	Ratomahenina, R., Chabalier, C., Galzy, P. (1994). Concerning Sporendonema casei Desmazieres [France, moulds in cheeses] Latte 19(6) 616-617	CBS 355.29	Desmazières, J.B.H.J. (1827). Annales des Sciences Naturelles, Botanique 11: 246-249.
Fungi	*Basidiomycota*	*Cystofilobasidiaceae*	*Cystofilobasidium*	*Cystofilobasidium infirmominiatum*		Dairy	Early, R. (1998). The technology of dairy products. Springer.	CBS 323	Hamamoto, M., Sugiyama, J., Komagata, K. (1988). Transfer of Rhodosporidium infirmominiatum to the genus Cystofilobasidium as Cystofilobasidium infirmominiatum comb. nov. J Gen Appl Microbiol 34, 271–278.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Fungi	*Basidiomycota*	*Mrakiaceae*	*Tausonia*	*Tausonia pullulans*		Plant Based	Batra, L.R. and Millner, P.D. (1974). Some Asian fermented foods and beverages and associated fungi. Mycologia, 66, 942-950.	CBS 2532	Liu, X-Z., Wang, Q-M., Göker, M. et al. (2015). Towards an integrated phylogenetic classification of the tremellomycetes. Studies in Mycology. Jun. 81: 85-147.
Fungi	*Zygomycota*	*Mucoraceae*	*Actinomucor*	*Actinomucor elegans*		Plant Based	Lu, J.M., Yu, R.C., Cheng, C.C. (1996). Purification and Some Properties of Glutaminase from A ctinomucor taiwanensis, Starter of Sufu[J]. Journal of the Science of Food & Agriculture, 1996, 70(4):509–514.	ATCC 22814	Walther, G., Pawłowska, J., Alastruey-Izquierdo, A., Wrzosek, M., Rodriguez-Tudela, J.L. & Dolatabadi, S. et al. (2013). DNA barcoding in mucorales: an inventory of biodiversity. Persoonia - Molecular Phylogeny and Evolution of Fungi,2013,30(3), 11-47.
Fungi	*Zygomycota*	*Mucoraceae*	*Mucor*	*Mucor circinelloides*		Plant Based	Han, B.Z., Kuijpers, A.F.A., Thanh, N.V. & Nout, M.J.R. (2004). Mucoraceous moulds involved in the commercial fermentation of sufu pehtze. Antonie Van Leeuwenhoek, 85(3), 253-7.	CBS 195.68	Walther, G., Pawlowska, J., Alastruey-Izquierdo, A., Wrzosek, M. et al. (2013). DNA barcoding in Mucorales: an inventory of biodiversity. Persoonia, 2013, 30, 11-47.
Fungi	*Zygomycota*	*Mucoraceae*	*Mucor*	*Mucor flavus*		Plant Based	Cheng, Y.Q., Hu, Q., Li, L.T. et al. (2009). Production of sufu, a traditional Chinese fermented soybean food, by fermentation with Mucor flavus at low temperature.[J]. Food Science & Technology Research, 2009, 15(4):347-352.	CBS 234.35	Walther, G., Pawlowska, J., Alastruey-Izquierdo, A., Wrzosek, M. et al. (2013). DNA barcoding in Mucorales: an inventory of biodiversity. Persoonia,2013, 30, 11-47.
Fungi	*Zygomycota*	*Mucoraceae*	*Mucor*	*Mucor fuscus*		Dairy	Hermet, A., Méheust, D., Mounier, J., Barbier, G., Jany, J.L. (2012). Molecular systematics in the genus Mucor with special regards to species encountered in cheese. Fungal Biol., 116, 692-705.	CBS 132.22	Walther, G., Pawłowska, J., Alastruey-Izquierdo, A., Wrzosek, M., Rodriguez-Tudela, J.L., Dolatabadi, S., Chakrabarti, A., de Hoog, G.S. (2013). DNA barcoding in Mucorales: an inventory of biodiversity. Persoonia, 30, 11-47.
Fungi	*Zygomycota*	*Mucoraceae*	*Mucor*	*Mucor hiemalis*		Plant Based	Han, B.Z., Kuijpers, A.F.A., Thanh, N.V., Nout., R.M.J. (2004). Mucoraceous moulds involved in the commercial fermentation of Sufu Pehtze. Antonie van Leeuwenhoek Volume 85, Number 3, 253-257.	CBS 201.65	Wehmer, C. (1903). Der Mucor der Hanfrötte, M. hiemalis nov. spec. Annales Mycologici 1, 37-41.
Fungi	*Zygomycota*	*Mucoraceae*	*Mucor*	*Mucor lanceolatus*		Dairy	Hermet, A., Méheust, D., Mounier, J., Barbier, G., Jany, J.L. (2012). Molecular systematics in the genus Mucor with special regards to species encountered in cheese. Fungal Biol., 116, 692-705.	CBS 131276	Walther, G., Pawłowska, J., Alastruey-Izquierdo, A., Wrzosek, M., Rodriguez-Tudela, J.L., Dolatabadi, S., Chakrabarti, A., de Hoog, G.S. (2013). DNA barcoding in Mucorales: an inventory of biodiversity. Persoonia, 30, 11-47.
Fungi	*Zygomycota*	*Mucoraceae*	*Mucor*	*Mucor mucedo*		Dairy	Oterholm, A. (2003). Norwegian cheeses from a historical perspective — Gamelost. Meieriposten, 9, 200–211. Oterholm, A. (2003). Norwegian cheeses from a historical perspective — Pultost. Meieriposten, 9, 264–274.	CBS 640.67	Persoon, C.H. (1801). Synopsis methodica fungorum 1-706
Fungi	*Zygomycota*	*Mucoraceae*	*Mucor*	*Mucor plumbeus*		Dairy	Han, B.Z., Rombouts, F.M., Nout, M.J. (2001). A Chinese fermented soybean food. Int J Food Microbiol. 65, 1-10. Hayaloglu, A.A., Kirbag, S. (2007). Microbial quality and presence of moulds in Kuflu cheese. Int J Food Microbiol. 115, 376-80.	CBS 129.41	Bonorden, H.F. (1864). Abhandlungen der Naturforschenden Gesellschaft zu Halle 8, 109.
Fungi	*Zygomycota*	*Mucoraceae*	*Mucor*	*Mucor racemosus*		Dairy	Han, B.Z., Rombouts, F.M., Nout, M.J. (2001). A Chinese fermented soybean food. Int J Food Microbiol. 65, 1-10. Hayaloglu, A.A., Kirbag, S. (2007). Microbial quality and presence of moulds in Kuflu cheese. Int J Food Microbiol. 115, 376-80.	CBS 260.68	Fresenius, G. (1850). Beiträge zur Mykologie 1, 12.
Fungi	*Zygomycota*	*Mucoraceae*	*Rhizopus*	*Rhizopus microsporus*		Plant Based	Shrestha, H., Rati, E.R. (2003). Defined microbial starter for the production of Poko - a traditional fermented food product of Nepal. Food Biotechnol 17(1) 15-25	CBS 631.82	Schipper, M.A.A., Stalpers, J.A. (1984). A revision of the genus Rhizopus. II. The Rhizopus microsporus-group. Studies in Mycology 25 20-34
Fungi	*Zygomycota*	*Mucoraceae*	*Rhizopus*	*Rhizopus oligosporus*		Plant Based	Rusmin, S., Ko, S.D. (1974). Rice-Grown Rhizopus oligosporus Inoculum for Tempeh Fermentation. Appl Microbiol. 28, 347-50.	CBS 377.62	Abe, A., Oda, Y., Asano, K , Sone, T., 2006. The molecular phylogeny of the genus Rhizopus based on rDNA sequences. Biosci Biotechnol Biochem. 70, 2387-93.

Kingdom	Phylum	Family	Genus	Species	Sub Species	Food Usage	Reference Food Usage	Type Strain	Reference Taxonomy
Fungi	*Zygomycota*	*Mucoraceae*	*Rhizopus*	*Rhizopus oryzae*		Alcoholic Beverages	Lv, X-C., Weng, X., Zhang, W., Rao, P-F., Ni, L. (2012). Microbial diversity of traditional fermentation starters for Hong Qu glutinous rice wine as determined by PCR-mediated DGGE. Food Control Volume 28, Issue 2, December, Pages 426-434	CBS 111233	Went, F.A.F.C., Prinsen Geerligs, H.C. (1895). Observation of Yeast and Moulds for Arack fermentation. Verhandelingen, Koninklijke Nederlandse Akademie van Wetenschappen, Afdeling Natuurkunde 4 3-31
Fungi	*Zygomycota*	*Mucoraceae*	*Rhizopus*	*Rhizopus oryzae*		Plant Based	Rehms, H., Barz, W. (1995). Degradation of stachyose, raffinose, melibiose and sucrose by different tempe-producing Rhizopus fungi. Appl Microbiol Biotechnol. 44(1-2):47-52. Essers, A.J., Jurgens, C.M., Nout, M.J. (1995). Contribution of selected fungi to the reduction of cyanogen levels during solid substrate fermentation of cassava. Int J Food Microbiol. 26(2):251-7.	CBS 111233	Went, F.A.F.C., Prinsen Geerligs, H.C. (1895). Observation of Yeast and Moulds for Arack fermentation. Verhandelingen, Koninklijke Nederlandse Akademie van Wetenschappen, Afdeling Natuurkunde 4 3-31
Fungi	*Zygomycota*	*Mucoraceae*	*Rhizopus*	*Rhizopus stolonifer*		Plant Based	Rehms, H., Barz, W. (1995). Degradation of stachyose, raffinose, melibiose and sucrose by different tempe-producing Rhizopus fungi. Appl Microbiol Biotechnol. 44(1-2):47-52. Essers, A.J., Jurgens, C.M., Nout, M.J. (1995). Contribution of selected fungi to the reduction of cyanogen levels during solid substrate fermentation of cassava. Int J Food Microbiol. 26(2):251-7.	CBS 403.51	Liou, G.Y., Chen, S.R., Wei, Y.H., Lee, F.L., Fu, H.M., Yuan, G.F., Stalpers, J.A. (2007). Polyphasic approach to the taxonomy of the Rhizopus stolonifer group. Myc Res III 196-203

7 REFERENCES

1. Bourdichon, F., Casaregola, S., Farrokh, C., Frisvad, J.C., Gerds, M.L., Hammes, W.P., Harnett, J., Huys, G., Laulund, S., Ouwehand, A., Powell, I.B., Prajapati, J.B., Seto, Y., Ter Schure, E., Van Boven, A., Vankerckhoven, V., Zgoda, A., Tuijtelaars, S., Hansen, E.B., (2012a). Food fermentations: microorganisms with technological beneficial use. International Journal of Food Microbiology 154(3) 87–97.
2. Bourdichon, F., Berger, B., Casaregola, S., Farrokh, C., Frisvad, J.C., Gerds, M.L., Hammes, W.P., Harnett, J., Huys, G., Kleerebezem, M., Laulund, S., Ouwehand, A., Powell, I.B., Prajapati, J.B., Seto, Y., Ter Schure, E., Van Boven, A., Vankerckhoven, V., Zgoda, A., Bech Hansen, E. (2012b). A Safety Assessment of Microbial Food Cultures with History of Use in Fermented Dairy Products. Bulletin of IDF n° 455, 2–12.
3. Bourdichon, F., Berger, B., Casaregola, S., Farrokh, C., Frisvad, J.C., Gerds, M.L., Hammes, W.P., Harnett, J., Huys, G., Laulund, S., Ouwehand, A., Powell, I.B., Prajapati, J.B., Seto, Y., Ter Schure, E., Van Boven, A., Vankerckhoven, V., Zgoda, A., Bech Hansen, E. (2012c). Building an Inventory of Microbial Food Cultures with a Technological Role in Fermented Food Products. Bulletin of IDF n°455, 13–21.
4. Bourdichon, F., Boyaval, P., Casaregola, S., Dupont, J., Farrokh, C., Frisvad, J.C., Hammes, W.P., Huys, G., Jany, J.L., Laulund, S., Ouwehand, A., Seto, Y., Zgoda, A., Bech Hansen, E. (2012d). The 2012 Inventory of Microbial Species with Technological Beneficial Role in Fermented Food Products. Bulletin of IDF n°455, 22–61.
5. Bourdichon, F., Alper, I., Bibiloni, R., Dubois, A., Laulund, S., Miks, M., Morelli, L., Zuliani, V., Yao, S. (2018). Inventory of Microbial Food Cultures with safety demonstration in fermented food products. Update of the Bulletin of the IDF n°455-2012. Bulletin of IDF n°495, 5–61.
6. Bourdichon, F., Laulund, S., Tenning, P. (2019). Inventory of microbial species with a rationale: a comparison of the IDF/EFFCA inventory of microbial food cultures with the EFSA Biohazard Panel qualified presumption of safety. FEMS Microbiology Letters 366(5):fnz048. doi: 10.1093/femsle/fnz048. PMID: 30839062.
7. Campbell-Platt, G. (1994). Fermented foods — a world perspective. Food Research International 27, 3, 253–257.
8. Capozzi, V., Fragasso, M., Romaniello, R., Berbegal, C., Russo, P., Spano, G. (2017). Spontaneous Food Fermentations and Potential Risks for Human Health. Fermentation 3(4):49. https://doi.org/10.3390/fermentation3040049.
9. Capozzi, V., Fragasso, M., Russo, P. (2020). Microbiological Safety and the Management of Microbial Resources in Artisanal Foods and Beverages: The Need for a Transdisciplinary Assessment to Conciliate Actual Trends and Risks Avoidance. Microorganisms 8(2):306. doi: 10.3390/microorganisms8020306. PMID: 32098373; PMCID: PMC7074853.
10. Dank, A., van Mastrigt, O., Yang, Z., Dinesh, V.M., Lillevang, S.K., Weij, C., Smid, E.J. (2021). The cross-over fermentation concept and its application in a novel food product: The dairy miso case study. LWT-Food Science and Technology Vol142 ISSN 0023–6438, https://doi.org/10.1016/j.lwt.2021.111041.
11. Filippis, D.F., Parente, E., Ercolini, D. (2016). Metagenomics insights into food fermentations. Microbial Biotechnology (2017) 10(1), 91–102 doi:10.1111/1751-7915.12421.
12. Herman, L., Chemaly, M., Cocconcelli, P.S., Fernandez, P., Klein, G., Peixe, L., Prieto, M., Querol, A., Suarez, J.E., Sundh, I., Vlak, J., Correia, S. (2019). The qualified presumption of safety assessment and its role in EFSA risk evaluations: 15 years past. FEMS Microbiology Letters 366(1):fny260. doi: 10.1093/femsle/fny260. PMID: 30535073; PMCID: PMC6311724.
13. Laulund, S., Wind, A., Derkx, P.M.F., Zuliani, V. (2017). Regulatory and Safety Requirements for Food Cultures. Microorganisms. 5(2):28. doi:10.3390/microorganisms5020028.
14. Mogensen, G., Salminen, S., O'Brien, J., Ouwehand, A., Holzapfel, W., Shortt, C., Fonden, R., Miller, G.D., Donohue, D., Playne, M., Crittenden, R., Salvadori, B., Zink, R. (2002a). Food microorganisms - health benefits, safety evaluation and strains with documented history of use in foods. Bulletin of IDF n°377, 4–9.
15. Mogensen, G., Salminen, S., O'Brien, J., Ouwehand, A., Holzapfel, W., Shortt, C., Fonden, R., Miller, G.D., Donohue, D., Playne, M., Crittenden, R., Salvadori, B., Zink, R. (2002b). Inventory of microorganisms with a documented history of use in food. Bulletin of IDF n°377, 10–19.
16. Papadimitriou, K., Pot, B., Tsakalidou, E. (2015). How microbes adapt to a diversity of food niches. Current Opinion in Food Science. 2:29–35 https://doi.org/10.1016/j.cofs.2015.01.001.
17. Tamang, J.P., Watanabe, K., Holzapfel, W.H. (2016). Review: Diversity of Microorganisms in Global Fermented Foods and Beverages. Frontiers in Microbiology. 7:377. doi: 10.3389/fmicb.2016.00377. PMID: 27047484; PMCID: PMC4805592.
18. Yao, S., Wang, P., Bai, F., Yu, X., Cao, Y., Cheng, K., Ge, Y., Xin, D., Zhang, T., Liu, Y., Cai, C. and Cheng, C. (2021). Research on the inventory of microbial food cultures in Chinese traditional fermented foods (2nd edition) Food and Fermentation Industries:1–30[2021-10-02]. https://doi.org/10.13995/j.cnki.11-1802/ts.029332.
19. Zheng, J., Wittouck, S., Salvetti, E., Franz, C.M.A.P., Harris, H.M.B., Mattarelli, P., O'Toole, P.W., Pot, B., Vandamme, P., Walter, J., Watanabe, K., Wuyts, S., Felis, G.E., Gänzle, M.G., Lebeer, S. (2020). A taxonomic note on the genus Lactobacillus: Description of 23 novel genera, emended description of the genus Lactobacillus Beijerinck 1901, and union of Lactobacillaceae and Leuconostocaceae. International Journal of Systematic and Evolutionary Microbiology. 70(4):2782-2858. doi: 10.1099/ijsem.0.004107. PMID: 32293557.
20. Skerman, V.B.D., McGowan, V., Sneath, P.H.A., editors, 1989. Approved Lists of Bacterial Names (Amended). Washington (DC): ASM Press; PMID: 20806452

ANNEX 1: DEFINITIONS

The definitions used in the present Bulletin are based upon the ones defined in the 2012 publications: IDF Bulletin #455-2012 and peer review publication in the International Journal of Food Microbiology [1A, 2A].

MICROBIAL FOOD CULTURES (MFCS):

"Microbial food cultures are live bacteria, yeasts or moulds used in food production".

MFC preparations are formulations, consisting of one or more microbial species and/or strains, including media components carried over from fermentation in addition to components which are necessary for their survival, storage, standardization, and to facilitate their application in the food production process.

FERMENTATION:

Fermentation of foods occurs in approximately one-third of the world food production. While fermented foods per se have been part of the human diet since approximately 10 000 B.C., it is only since the emergence of Food Microbiology (i.e., after Pasteur's scientific advances) that awareness of the major impact of microbial food cultures in our diet has been available.

Around 1877, the role of a sole bacterium, *Bacterium lactis (Lactococcus lactis)*, in fermented milk was shown by Sir John Lister.

Louis Pasteur defined fermentation, from the Latin word fervere, as "La vie sans l'air" (life without air).

Fermentation plays many different roles in food processing. Major roles include:
- Preservation of food through formation of inhibitory metabolites such as organic acid (lactic acid, acetic acid, formic acid, propionic acid), ethanol and bacteriocins, often in combination with decreased water activity (by drying or use of salt).
- Improving food safety through inhibition of pathogens or removal of toxic compounds
- Improving the nutritional value and organoleptic quality of the food

MICROBIAL SPECIES:

Taxonomy and systematics constitute the basis for the regulatory frameworks for MFCs. Yet the definition of a microbial species as a taxonomic unit is still not widely adopted. In the third edition of Prokaryotes, a prokaryotic species is defined by:
- a phylogenetic component given as "the smallest diagnosable cluster of individual organisms within which there is a parental pattern of ancestry and descendants"

and

- a taxonomic component given as "a group of related organisms that is distinguished from similar groups by a constellation of significant genotypic, phenotypic, and ecological characteristics."

A bacterial species is represented by a type strain with individual strains showing a high degree of phenotypic and/or genotypic similarity to the type strain regarded as belonging to the same species. Whilst objective measures of relatedness have been proposed (such as percentage genome hybridization or sequence similarity), there is no simple definition of the species as a taxonomical unit.

MICROBIAL STRAIN:

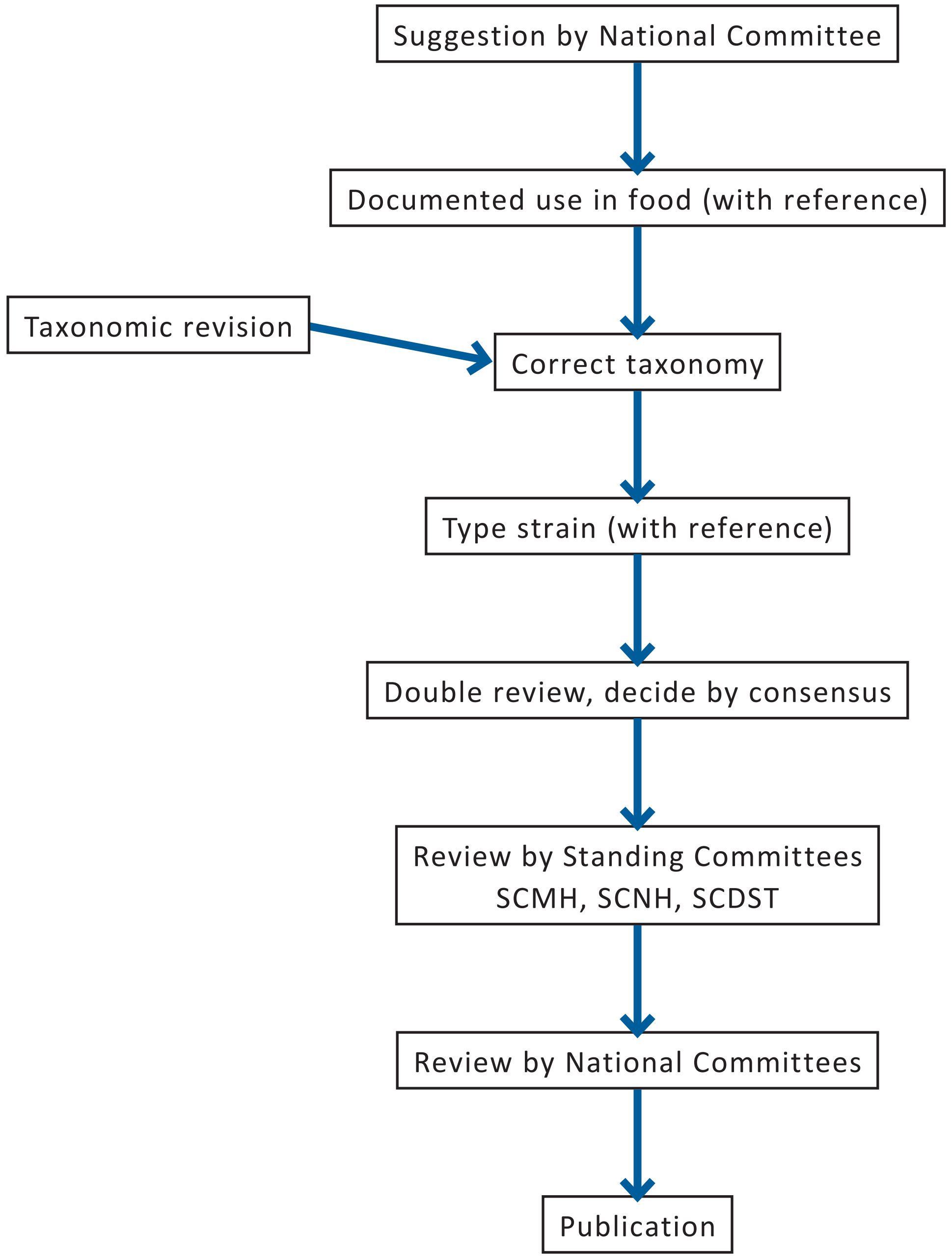
The strain is the most stringent classification cluster recognized. Traditionally based upon isolation of culture colonies and phenotypic observation, it is now classically based on the global sequence of the genome.

Considering the variation of genome sequences during replication, it is not yet clearly defined how strains should be differentiated, and phenotypic characteristics and epidemiological data are still considered to provide information for inclusion, or not, of different isolates to the same strain.

REFERENCES:

1. Bourdichon, F., Casaregola, S., Farrokh, C., Frisvad, J.C., Gerds, M.L., Hammes, W.P., Harnett, J., Huys, G., Laulund, S., Ouwehand, A., Powell, I.B., Prajapati, J.B., Seto, Y., Ter Schure, E., Van Boven, A., Vankerckhoven, V., Zgoda, A., Tuijtelaars, S., Hansen, E.B. (2012a). Food fermentations: microorganisms with technological beneficial use. Int J Food Microbiol 154(3) 87–97.
2. Bourdichon, F., Berger, B., Casaregola, S., Farrokh, C., Frisvad, J.C., Gerds, M.L., Hammes, W.P., Harnett, J., Huys, G., Kleerebezem, M., Laulund, S., Ouwehand, A., Powell, I.B., Prajapati, J.B., Seto, Y., Ter Schure, E., Van Boven, A., Vankerckhoven, V., Zgoda, A., Bech Hansen, E. (2012b). A Safety Assessment of Microbial Food Cultures with History of Use in Fermented Dairy Products. Bulletin of IDF n°455, 2–12.

ANNEX 2: PROCESS FOR SPECIES INCLUSION



Publication #3 – Fermentation and Biopreservation: the forgotten role of food cultures

Bourdichon, F., Arias, E., Babuchowski, A., Bückle, A., Dal Bello, F., Dubois, A., Fontana, A., Fritz, D., Kemperman, R., Laulund, S., Mac Auliffe, O., Miks, M.H., Papademas, P., Patrone, V., Sharma, D.K., Sliwinski, E., Stanton, C., Von Ah, U., Yao, S., Morelli, L., 2021.

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Fermentation is one of if not the oldest food processing technique, yet it is still an emerging field when it comes to its numerous mechanisms of action and potential applications. The effect of microbial activity on the taste, bioavailability and preservation of the nutrients and the different food matrices has been deciphered by the insights of molecular microbiology. Among those roles of fermentation in the food chain, biopreservation remains the one most debated. Presumably because it has been underestimated for quite a while, and only considered – based on a food safety and technological approach – from the toxicological and chemical perspective. Biopreservation is not considered as a traditional use, where it has been by design – but forgotten – as the initial goal of fermentation. The 'modern' use of biopreservation is also slightly different from the traditional use, due mainly to changes in cooling of food and other ways of preservation. Extending shelf life is considered to be one of the properties of food additives, classifying – from our perspective –biopreservation wrongly and forgetting the role of fermentation and food cultures. The present review will summarize the current approaches of fermentation as a way to preserve and protect the food, considering the different way in which food cultures and this application could help tackle food waste as an additional control measure to ensure the safety of the food.

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Full-length Review

FULL-LENGTH REVIEW – Food Microbiology

The forgotten role of food cultures

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One sentence summary: Perspective on the potential of food cultures for the biopreservation of food products and applications to limit food waste.

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ABSTRACT

Fermentation is one of if not the oldest food processing technique, yet it is still an emerging field when it comes to its numerous mechanisms of action and potential applications. The effect of microbial activity on the taste, bioavailability and

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preservation of the nutrients and the different food matrices has been deciphered by the insights of molecular microbiology. Among those roles of fermentation in the food chain, biopreservation remains the one most debated. Presumably because it has been underestimated for quite a while, and only considered – based on a food safety and technological approach – from the toxicological and chemical perspective. Biopreservation is not considered as a traditional use, where it has been by design – but forgotten – as the initial goal of fermentation. The 'modern' use of biopreservation is also slightly different from the traditional use, due mainly to changes in cooling of food and other ways of preservation, Extending shelf life is considered to be one of the properties of food additives, classifying – from our perspective – biopreservation wrongly and forgetting the role of fermentation and food cultures. The present review will summarize the current approaches of fermentation as a way to preserve and protect the food, considering the different way in which food cultures and this application could help tackle food waste as an additional control measure to ensure the safety of the food.

Keywords: food cultures; fermentation; biopreservation; food safety; regulation; mechanism of action

INTRODUCTION

Food preservation has been a key concern since the earliest days of humanity. Among the numerous empirical processes that have been developed and passed down, fermentation is one of the oldest preservation techniques and still widely used in various food matrices. Fermentation produces beneficial effects in foods that undergo chemical changes caused by microorganisms such as bacteria or yeasts (Caplice and Fitzgerald 1999).

Fermentation plays different roles in food processing. Major roles considered are as follows:

- Preservation of food through formation of inhibitory metabolites such as organic acid (lactic acid, acetic acid, formic acid, andpropionic acid), ethanol, bacteriocins and so on, often in combination with decrease of water activity (by drying or use of salt; Ross, Morgan and Hill 2002; Gaggia *et al.* 2011.
- Improving food safety through inhibition of pathogens (Adams and Mitchell 2002, Adams and Nicolaides 2008) or removal of toxic compounds (Hammes and Tichaczek 1994.
- Improving the nutritional value (Poutanen, Flander and Katina 2009, van Boekel *et al.* 2010.
- Organoleptic quality of the food (Marilley and Casey 2004; Smit, Smit and Engels 2005; Lacroix *et al.* 2010; Sicard and Legras 2011).

Biopreservation is a natural way to protect against spoilage and harmful contamination in food. This helps keeping food products fresh and safe throughout shelf life, opening for the possibility of reducing food waste. The food industry is presently looking for means of producing safe food products with an extended shelf life thus reducing food waste and meeting the consumer demands for natural, low salt, low sugar foods and for reduced use of chemical preservatives. Fermented food products have a longer shelf life and are less prone to spoilage than fresh food products of the same matrix (e.g. cheese compared to milk). There have been advances in the understanding of food microbiology, and the ability to screen for food cultures with better ability to stabilize food provides food cultures with bioprotective effect (Bech Hansen 2002). The advances of science in this field are eventually restricted by regulations in place, as this protective role of food cultures is mistakenly assimilated to the category of food additives and is not considered as a traditional use of food cultures in the food chain (Laulund *et al.* 2017). The aim of the present review is to highlight how the use of food cultures is already protecting the fermented food products, with enhanced shelf life and reduced spoilage.

The microbial stability and safety as well as the sensory and nutritive quality of foods are achieved by applying a combination of several different preservative factors called hurdles. The most important hurdles for keeping food fresh and safe are temperature (high or low), water activity (a_w), acidity (pH), redox potential, preservatives (food additives), competitive microorganisms (bacteria, moulds and yeasts) and their metabolites. The competitive microorganisms with enhanced protective effect can be indigenous or be added as specifically selected food cultures.

As proposed by the International Dairy Federation on its factsheet on the topic (Available at: https://fil-idf.org/publications/free-of-charge/idf-factsheet-007–2019-bioprotection/) Biopreservation refers to enhanced food safety and extended shelf life of foods by indigenous and/or intentionally added microbiota, inhibiting growth of pathogenic and spoilage organisms due to microbiological competition and production of antimicrobial metabolites. Among the different species of food cultures, lactic acid bacteria have a major potential for use as biopreservation supported by their long history of safe use, proven antimicrobial properties, their capacity to naturally dominate the microflora and occupy the ecological niche during storage.

Food cultures for fermentation do all have biopreservation effects due to metabolically activities. While the traditional use of cultures in fermented foods refers to their positive action on product properties (texture, aroma, digestibility, . . .), more specific focus is now on food cultures with appropriate biopreservative properties for a given application, inhibition of the spoilage microflora and improvement of food safety.

Biopreservation enhances the effectiveness of a food management system, but is never an alternative to good cleaning practices, hygienic design of the production and cold chain conservation (Motarjemi and Nout 1996). Food cultures with biopreservative effect create an extra protective hurdle against specific pathogens and/or spoilage microorganisms in the product during processing and/or after the product has left the manufacturing facility, e.g. during transport, storage, retail display and even after opening of the packaging by the consumer (Baka et al 2014).

The selection and application of protective food cultures must comply with the same safety criteria as for all food cultures used in the food industry. Food cultures are chosen for their ability to control and reduce foodborne pathogens and spoilage microorganisms by exploiting microbial competition and dominance phenomena. Isolation, selection, detailed characterization and validation of cultures are a way of taking advantage of the natural way in which microorganisms compete with each other in a complex environment in order to ensure that the added biopreservative food culture has the specific characteristics under specific condition(s). This allows more control over the process than with spontaneous fermentation. A spontaneous fermentation is actually also what takes place in fresh and ready to eat (RTE) foods resulting in spoilage New analytical tools make it feasible to identify and characterize microorganisms present in a given environment. These enable the selection of the best candidates from a very high number of food cultures to protect against pathogenic and spoilage microorganisms. Individual food culture strains within the same species have different fermentation properties that can create variations in taste, aromas and texture/viscosity that may or may not be wanted. A careful selection of individual strains can be based on well-known and commonly used species, but have to be tested individually regarding properties contributing to fit the purpose of certain biopreservative effects and possible side effects (Bourdichon *et al.* 2012).

GENETIC BASIS AND PRODUCTION OF SPECIFIC METABOLITES AND/OR ENZYMES

Microbes have the ability to produce an extraordinary array of metabolic by-products exhibiting a bactericidal or bacteriostatic activity such as organic acids, enzymes, bacteriocins and many other secondary metabolites. Biopreservation involves applying food-grade microorganisms to extend the shelf life of foods, and preventing the development of undesirable microorganisms (Elsser-Gravesen and Elsser-Gravesen 2014).

GENERAL AND LOW MOLECULAR WEIGHT METABOLITES

The end products of fermentation may include organic acids (lactate, acetate, succinate and formate), gases (CO_2, H_2 and SO_2), hydrogen peroxide and other metabolites (ethanol, diacetyl, aldehydes, ketones, fatty acids and so on). The proportions of these end products vary between and within species. Many of these metabolites display antagonistic effects against other microbes through various modes of action (Ben Said *et al.* 2019). Examples include CO_2 which has long been documented as inhibitory to certain pathogenic species. Heterofermentative lactic acid bacteria (LAB) species produce CO_2 from formate, creating an anaerobic environment in the food which is hostile to aerobic species. Hydrogen peroxide (H_2O_2)-related inhibition occurs through oxidative damage of proteins and, at times, an increased membrane permeability take place in the target organisms. Another example is diacetyl (2,3-butanedione), produced by certain LAB species. While diacetyl can be employed as a biopreservative, its contribution to the flavor and aroma of a product means that it has limited preservative uses in foods where diacetyl is not wanted ad a major flavor component. (Drosinos *et al.* 2005).

ANTIFUNGAL COMPOUNDS

Antifungal compounds are key to avoiding spoilage with yeasts and/or moulds, and a recent review describes the role and use of LAB as bioprotective food cultures against fungal spoilage in foods (Siedler, Balti and Neves 2019). Some compounds previously discussed, e.g. certain organic acids such as propionic acid, and reuterin can be used to inhibit fungi as well as bacteria (Corsetti *et al.* 1998, Cleusix *et al.* 2007). Phenolic acids produced by *Lactiplantibacillus plantarum* (formerly *Lactobacillus plantarum*) are involved in the antifungal activity or in the reduction of aflatoxin production in e. g. maize (Nazareth *et al.* 2020). In other cases, antifungal compounds produced by LAB are peptides by chemical nature, such as those against *Aspergillus flavus* on maize (Muhialdin *et al.* 2020). Phenyllactic acid is another compound that can be used to inhibit both bacteria and fungi. It is present in different forms such as 3-phenyllactic acid and 4-phenyllactic acid. Both are produced by LAB (Ström *et al.* 2002, Mu *et al.* 2010), whereas 3-phenyllactic acid can also be produced by *G. candidum* (Dieuleveux, Lemarinier and Guéguen 1998). In the latter case, the inhibition can also be towards *Fusarium* spp. and reducing the toxin concentration (Kawtharani *et al.* 2020). Since phenyllactic acid is produced by many LAB, it is often also naturally present in fermented foods and can be used in a variety of food products.

KILLER YEASTS

The multitude of fermented bacterial substances and mechanisms to control growth of other microorganisms, are similar known from yeasts fermentation. Killer yeasts produce and excrete extracellular proteins which are lethal to sensitive strains of other yeasts or other microorganisms (Starmer *et al.* 1987). These killer toxins (mycocins) were first detected in *Saccharomyces cerevisiae* and later in strains of other species such as *Debaromyces* spp., *Kluyveromyces* spp., *Pichia* spp., *Metschnikowia* spp. as well (reviewed in Mannazzu *et al.* 2019). Killer yeasts are applied as biocontrol agents especially in winemaking to control indigenous yeasts which produce offflavors (reviewed in Morata *et al.* 2020). Moreover, they have been used as bioprotectors in vegetables, olives, beer, sake, dry-cured ham, sausages, yogurt and cheese (reviewed in Salas *et al.* 2017, Medina-Córdova *et al.* 2018, Guimaraes *et al.* 2018, Mannazzu *et al.* 2019).

BACTERIOCINS

Bacteriocins are ribosomally synthesized peptides or proteins that possess antimicrobial activity towards closely related bacterial species, whereas the producing bacterium is immune to the specific bacteriocin itself (De Vuyst and Leroy 2007).

As examples, nisin has been chosen among lantibiotics (Class I bacteriocins), and lactococcin G and pediocin A among nonlantibiotics (Class II bacteriocins).

Nisin

Different strains of *Lactococcus lactis* subsp. *lactis* are known as bacteriocin producers. One of the most intensively studied and used is the lantibiotic nisin. Nisin is an effective agent against several undesirable Gram-positive bacteria in cheese and various other foods. It was also the first antimicrobial peptide approved by the FDA to be utilized as a food additive preservative (De Vuyst and Vandamme). The list of FDA approved food additives and GRAS (generally recognized as safe) notices with intended antimicrobial effect is provided in Table 1 (As available on December 2020–Available at: https://www.fda.gov/food/gras-notice-inventory/recently-published-gras-notices-and-fda-letters).

Nisin is a ribosomally synthesized lantibiotic and many variants have been discovered, naturally produced by several strains of *L. lactis* (i.e. Nisin A, Z, Q, F) and *S. uberis* (i.e. Nisin U, U2; Gross and Morell 1971; de Vos *et al.* 1993; Zendo *et al.* 2003; Wirawan *et al.* 2006; de Kwaadsteniet, Ten Doeschate and Dicks 2008). The most common variants are nisins A and Z, which differ in one amino acid residue. The biosynthesis and regulatory machineries of lantibiotics are encoded by genes organized in operons. Single genes can vary their location within the operon, but invariably they are clustered on the genome. For bacteriocin synthesis up to three functions are required: production, immunity and, optionally, quorum sensing. In the case of

Table 1. List of FDA approved food additives and GRAS (generally recognized as safe) notices with intended antimicrobial effect.

Food additives	**Intended use**	**Food matrix**
Acetic acid	Buffer and neutralizing agent	Cheese
Hydrogen peroxide	Used in combination with acetic acid to form peroxyacetic acid	Wash water for fruits and vegetable that are not raw agricultural commodities (59 ppm)
Lactic acid	Buffer and neutralizing agent	Bakery products, cheese, frozen desserts, fruit butters, jellies and preserves
Propionic acid	Preservative	Swiss and Gruyere Cheese
Natamycin (pimaricin)	Antimycotic	Cheese (< 20 mg/kg finished product)
Nisin preparation	Antimicrobial	Cheese (< 250 ppm)
GRAS-Microorganisms		
Lactobacillus curvatus DSM 18775	Antimicrobial (*Listeria monocytogenes*)	Ready-to-eat cooked meat, poultry products
Lb. acidophilus, Lb. lactis and *Pediococcus acidilactici*	Antimicrobial	Meat, poultry
Carnobacterium maltaromaticum CB1 (viable and heat-treated)	Antimicrobial (*Listeria monocytogenes*)	Various foods
Carnobacterium maltaromaticum CB1	Antimicrobial (*Listeria monocytogenes*)	Ready-to-eat meat products
GRAS-Bacteriocins		
Bacteriocin preparations specific to Salmonella	Antimicrobial (Salmonella)	Red meats, poultry and egg products (max. application rate 3 mg/kg or L)
Colicin preparations	Antimicrobial	Meat (application rate of 1–10 mg/kg)
Natamycin	Antimycotic (yeasts and molds)	Yogurt (levels < 5 ppm finished product)
Nisin	Antimicrobial	Casings of frankfurters; cooked meat; poultry products

nisin, these functions are scattered across the nisin biosynthesis gene cluster nisABTCIPRKFEG which consists of 11 genes divided into four operons (Lubelski *et al.* 2008). Bacteriocin production is encoded by nisABTC and nisP, nisA encoding the bacteriocin precursor, nisT the transporter exporting the unmodified precursor, nisBC encoding post-translational modification functions and nisP encoding the leader peptidase (Kuipers *et al.* 1993). Immunity is encoded by nisI and nisEFG, a dedicated immunity protein and an ABC-transporter, respectively (McAuliffe, Ross and Hill 2001). Lastly, the two-component signal transduction system responding to the mature nisin consisting of a response regulator and histidine kinase is encoded by nisRK, respectively (Ge *et al.* 2017). The self-protection mechanism of the food culture producers can involve more than one system. Comparative genomic analyses by Wels and collaborators (Wels *et al.* 2019) on publicly available genome sequences of *L. lactis* subsp. *lactis* and subsp. *cremoris* revealed a complete nisin biosynthesis cassette nisABTCIPRKFEG (Kuipers *et al.* 1993) on the chromosome of the subspecies *lactis* strains CV56 and IO-1. This gene cluster is flanked by transposase fragments. A complete nisin gene cluster was also found in the subspecies *lactis* strains KF134, KF146, KF196, KF282, K231, KF24, K337, KF67, KF7, Li-1 and LMG8526, at the same chromosomal insert position as in strain CV56. It was highlighted that all the strains of plant or vegetable origin can produce nisin Z. On the contrary, the subspecies *cremoris* strain V4 and the subspecies *lactis* strains LMG14418, LMG9446 and KF147 present an incomplete chromosomal gene cluster and cannot produce nisin, but they have maintained some immunity genes (i.e. nisFEG and/or nisI) (Wels *et al.* 2019). *Lactococcus lactis* ssp. *cremoris* FG2 and N41, from dairy starter and soil/grass, respectively, present a partial nis gene cluster encoding only nisP, nisI and a truncated nisC. This organization suggests a localization typical of plasmid (Tarazanova *et al.* 2016). The original nisin gene cluster is chromosome based. The detection of a plasmid based nisin variant produced by *Streptococcus capitis* (O'Sullivan *et al.* 2020) and the detection of nisin variants in multiple species suggest that nisin like gene clusters can also be horizontally transferred on mobile elements.

Lactococcus lactis cheese starter cultures may either produce and/or tolerate the antimicrobial bacteriocin nisin. It is therefore relevant upon the choice of food cultures to assess their natural resistance or sensitivity to potentially produced bacteriocins (Van Gijtenbeek *et al.* 2021).

Pediocin PA-1

Pediocin, produced by *Pediococcus acidilactici*, belongs to the class II bacteriocins (nonlantibiotics), a large and diverse group of antimicrobial compounds that includes small heat-stable, cationic and hydrophobic/amphiphilic peptides. They are mainly active against other LAB, and they damage target cells by pore formation or by interfering with the integrity of the membrane (Nes *et al.* 1996). Though most have a limited activity spectrum, some, including pediocin PA-1, also inhibit more distantly related bacteria. The key interest in pediocin PA-1 in relation to biopreservation it its functionality in inhibition of the pathogen *Listeria monocytogenes*. Where the nisin biosynthetic gene cluster is an example of a tightly controlled complex bacteriocin expression system, the pediocin PA-1 genetic organization features the other extreme, with a basic organization of a single gene cluster composed of only four genes pedABCD expressed in a single operon. Pediocin PA-1 production is ensured by the pedA, the pediocin precursor gene and pedCD encoding a dedicated ABC-transporter, while immunity is encoded by pedB (Rodriguez *et al.* 2002). Additional immunity systems as well as a quorum sensing system are absent. Interestingly, the cluster encoding pediocin PA-1 and highly similar bacteriocins is located on a plasmid that can be and likely has been transferred between species (Cui *et al.* 2012).

Lactococcin G

Lactococcins belonging also to the class II bacteriocins (nonlantibiotics). They are mainly active against other *lactococci* and they damage target cells by pore formation or by interfering with the integrity of the membrane (Nes *et al.* 1996). Of the two-peptide bacteriocins (class IIb), lactococcin G (LcnG) is the most studied in relation to its mode of action. It is constituted of the peptides LcnG-α (39 residues) and LcnG-β (35 residues) (Rogne *et al.* 2008), and its bactericidal activity relies on causing leakage of Na^+ and K^+ ions from the membrane of sensitive cells (Moll *et al.* 1996, 1998). The main target of lactococcin G is the membrane protein UppP/BacA, involved in the synthesis of peptidoglycan in the strains *L. lactis* ssp. *lactis* IL1403 and *L. lactis* ssp. *cremoris* MG1363 (Kjos *et al.* 2014).

Lactococcin G cluster is composed of two structural genes encoding the pre-bacteriocins (lagA and lagB), an immunity gene (lagC), an ABC transporter gene (lagD) and, located downstream of lagD, a gene coding for a transport accessory protein (lagE; Oppergard *et al.* 2010). The mechanism responsible for the secretion of lactococcin G by LagD and its dependency on the LagE transport accessory protein are not yet clarified.

Lactococcus lactis strains LMG2081 and BGBM50 are known as lactococcin G producers (Niessen *et al.* 1992; Mirkovic *et al.* 2015). The complete sequence of lactococcin G operon (~4.9 kb) in *L. lactis* LMGT 2081 has been deposited in the NCBI database (GenBank accession number FJ938036). BLAST alignment of the cluster against the database revealed the presence of a nearly complete LcnG operon (94% coverage, 97% identity) also on the chromosome of *L. lactis* strain CBA3619 isolated from kimchi.

OTHER ANTIBACTERIAL COMPOUNDS

The term bacteriocin-like inhibitory substances (BLIS) is used for presumptive bacteriocins still under investigation until their amino acid structure is identified (Settanni and Corsetti 2008). Other antibacterial substances fit into neither the low molecular weight metabolites, bacteriocins nor BLIS categories. They are not less active and sometimes have a broader spectrum of inhibition. Some of the compounds show limited inhibitory effect alone and are more active together with other substances or in combination with lactic acid (pH) producing food culture(s) (Niku-Paavola *et al.* 1999). This was demonstrated in cheese with a mixture of strains (Settanni *et al.* 2011), where not only antimicrobial activity was measured, but also increased growth of the starter cultures. Examples of such antimicrobial compounds showing a broad-range inhibitory activity include reuterin, a compound produced by *Limosilactobacillus reuteri* (formerly *Lactobacillus reuteri*) that inhibits fungi but also Gram-negative bacteria (Schaefer *et al.* 2010), and indeed, inhibition of *Clostridium difficile* has also been shown (Cleusix *et al.* 2007). A further example is D-3-Phenyl-lactic acid, shown to have inhibitory activity towards various pathogens like *Salmonella enterica*, *L. monocytogenes* and produced by several LAB but also *Geotrichum candidum* (Dieuleveux, Lemarinier and Guéguen 1998, Rodríguez, Martínez and Kok 2012).

Reuterin

As a bacterium occurring in sourdough, dairy and meat products, *Limosilactobacillus reuteri* (formerly *Lactobacillus reuteri*) has gained interest as a potential bioprotective food culture due to its ability to synthesize reuterin, a broad-spectrum antimicrobial system consisting of an isomeric mixture of 3-hydroxypropionaldehyde (3-HPA; Vollenweider *et al.* 2003). Reuterin displays inhibitory activity against bacteria, yeast, moulds and protozoa, including food spoilage and pathogenic organisms (Schaefer *et al.* 2010). Notably, metabolism of glycerol has been demonstrated to improve the competitiveness of *L. reuteri* in sourdough (Lin and Gänzle 2014). *Limosilactobacillus reuteri* uses a CoA-dependent pathway, in which 3-HPA is obtained from glycerol in a reaction catalysed by the coenzyme B12-dependent glycerol/diol dehydratase (GDH; Talarico and Dobrogosz 1990); 3-HPA is subsequently converted to 3-hydroxypropionic acid (3-HP) and 1,3-propanediol (1,3-PDO) (Dishisha *et al.* 2014). The glycerol/diol dehydratase of *L. reuteri* has been shown to be encoded by three genes located in the propanediol-utilization (pdu) operon (PduCDE; Morita *et al.* 2008); adjacent to this operon, *L. reuteri* possesses cbi–hem–cob genes that encode the proteins for the biosynthesis of vitamin B12 (Santos *et al.* 2008). In addition, Srimulu *et al.* (2008) found that glycerol/diol dehydratase is associated with microcompartments called metabolosomes, and their structural proteins are encoded by genes located in the pdu operon. The structure of the pdu-cbi-cob-hem cluster in *L. reuteri*, displaying a putative transposase gene between the pdu and cbi-cob-hem operons and IS elements within flanking regions, suggests this gene cluster may be a genomic island that has been acquired through horizontal gene transfer (Morita *et al.* 2008). Based on this hypothesis, it seems reasonable to assume that other species of LAB besides *L. reuteri* may have acquired this genetic island during evolution. Indeed, glycerol metabolism leading to 3-HPA production has been reported in *Secundilactobacillus collinoides* (formerly *Lactobacillus collinoides*; Sauvageot et al. 2000), *Loigolactobacillus coryniformis* (formerly *Lactobacillus coryniformis*) isolated from cheese (Martin *et al.* 2005), *Levilactobacillus brevis* (formerly *Lactobacillus brevis*) and *Lentilactobacillus buchneri* (formerly *Lactobacillus buchneri*; Schutz and Radler 1984), *Lentilactobacillus diolivorans* (formerly *Lactobacillus diolivorans*) from ciders (Garai-Ibabe *et al.* 2008). Consistent with this, the pdu operon has been detected in *L. collinoides* (Sauvageot *et al.* 2002) and in *L. brevis* (Makarova *et al.* 2006).

Phenyllactic acid

3-phenyllactic acid (2-hydroxy-3-phenylpropanoic acid, PLA) is acknowledged as a relevant contributor to the anti-microbial activity of LAB in fermented foods. A wide range of LAB genera, such as *Lactobacillus*, *Leuconostoc*, *Weissella*, *Pediococcus* and *Enterococcus* (Magnusson *et al.* 2003; Valerio *et al.* 2004; Ndagano *et al.* 2011; Li *et al.* 2014), have been demonstrated to produce PLA, though PLA biosynthesis has been most extensively studied in *Lactiplantibacillus plantarum* (formerly *Lactobacillus plantarum*; Lavermicocca *et al.* 2000; Ström *et al.* 2002; Prema *et al.* 2010; Wu *et al.* 2020). Remarkably, PLA exerts inhibitory effects *in vitro* and *in vivo* on several spoilage and mycotoxigenic moulds from sourdoughs and bakery products (Lavermicocca, Valerio and Visconti 2003; Dal Bello *et al.* 2007; Ryan *et al.* 2011; Valerio *et al.* 2016).

In LAB, PLA is a by-product of phenylalanine (Phe) catabolism: phenylalanine is firstly transaminated to phenylpyruvic acid (PPA) by an aromatic aminotransferase (AAT; Yvon *et al.* 1997) and subsequently reduced to PLA by a 2-hydroxyacid dehydrogenase (2-HADH) such as lactate dehydrogenase (LDH; Vermeulen, Ganzle and Vogel 2006; Li, Jiang and Pan 2007; Mu *et al.* 2010). Although the genes encoding such enzymes are ubiquitously present in LAB, significant differences are recorded in the amount of PLA produced by different strains, and this disparity was ascribed to varying enzymatic activity of LDH toward PPA (Li *et al.* 2008). Recently, it has been demonstrated that *Lactiplantibacillus plantarum* (formerly *Lactobacillus plantarum*) LY-78 synthesizes PLA de novo via the Phe synthetic pathway and suggesting that panE1 (ketopantoate reductase), serA1 (D-3-phosphoglycerate dehydrogenase) and ldhD2 (D-lactate dehydrogenase 2) may be key genes of PLA biosynthesis in LAB (Sun *et al.* 2019).

CONTROL OF ACIDITY OF FERMENTED FOOD PRODUCTS AS A RESULT OF FERMENTATION

Acidification mechanism

Many parameters govern the survival and growth of microorganisms in food. The acidity or pH of a food can affect the type and number of microorganisms present. All microorganisms have an optimum pH value for growth, and altering the hydrogen ion concentration can influence the growth of an organism or even inhibit growth. In general, bacteria prefer to grow at a pH near neutrality (pH 6.5–7.5) but will tolerate a pH range of 4–9. Yeasts are more tolerant of lower pH values than bacteria, while moulds survive across the widest range of pH values. Foods with a pH value below 3.5 can support the growth of both yeasts and moulds. Because of the sensitivity of organisms to widely differing pH values, the pH provides a powerful selection which influences the species or group of microorganisms that will predominate in unaltered food products. For example, bacteria primarily spoil proteinaceous foods such as dairy, meat, poultry and seafood with a pH range of 5.5–6.5. In contrast, yeasts and moulds more commonly proliferate on fruits and vegetables with inherently lower pH values and little buffering capacity (Doores 2005).

One effective means to preserve food from spoilage is to increase the acidity of the food thereby creating an unfavourable environment for survival of undesirable microorganisms through natural fermentation. Depending on the final pH, this inhibition can be either biostatic or biocidal. The final result will depend on the microbial species, the type and concentration of the acidulant, the time of exposure, the buffering capacity of the food and most likely the compositional/chemical properties of the food (Doores 2005).

Microorganisms display varied sensitivity to acids. In most cases, they are vulnerable to the organic acids they produce because they are by-products of primary metabolism and as such are their natural 'electron sink'. It may happen, however, that in mixed culture fermentations, the produced acid is a source of energy for another microorganism. For example, LAB produce lactic acid as a by-product of their metabolism, which serves as an energy source for propionic acid bacteria (PAB) and the mould *Penicillium roqueforti*. *St. thermophilus* produces formic acid as a by-product of their metabolism, which serves as an energy source for *L. bulgaricus* in yogurt fermentation.

Organic acids are weak acids, so they do not dissociate completely in aqueous environments, and their antimicrobial activity depends on the degree of dissociation and the pH in the food environment. Hence, the antibacterial activity of organic acids is increased when the pH of the food is low. A decrease in pH leads to an increase in protonated acid concentration, decreasing the polarity of the molecules and consequently increasing the diffusion of acids across the cell membrane and into the cytoplasm (Doores 2005; Mani-López, García and López-Malo 2012). The inhibitory effect of organic acids is based on pH, concentration, chain length, type and degree of branching. Indeed, effective use of an acidulant depends on the dissociation constant (pKa) or the pH at which 50% of the total acid is dissociated. The pKa of most organic acids is between pH 3 and 5. The pKa of the acids most commonly found in fermented foods are: acetic acid, pKa 4.75; lactic acid, 3.08 and propionic acid, 4.87. Because the undissociated portion of the molecule is believed to be responsible for the antimicrobial effect, it would be advantageous to use the acids near these values from a biopreservation perspective. As the pH of a solution decreases, the concentration of the undissociated form will increase for all acids. For weaker acids, the undissociated proportion at any given pH will be higher than for stronger acids, i.e. those with a lower pKa (Adams 2014).

In foods having a range of buffering components such as proteins and amino acids, it is not easy (possible) to calculate a degree of dissociation of weak acid using the Henderson–Hasselbach equation. The issue may be further complicated by the presence of oil or fat into which the acid might partition preferentially. This would have the effect of decreasing the acidity in the aqueous phase in which microbial growth occurs and thereby the anticipated antimicrobial effect (Wilson, Wilson and Waspe 2000).

Because pH values below 4.5 will stop or severely curtail the growth of all the major bacterial pathogens and will, depending on the conditions, ultimately lead to their death/inactivation, food safety concerns tend to be much reduced when considering acidic/fermented foods. It has long been recognized that *Clostridium botulinum* spores will not germinate and grow at pH values below 4.6, and this is enshrined in various codes of practice. Usually, this organism can be well controlled by efficient acid production. Levels of acidity which do not kill pathogens or stop their growth entirely can still improve food safety. The risk from infectious pathogens such as *Salmonella* spp. will be lower if growth and thereby numbers of the organisms are restricted and, at suboptimal pH, toxigenic organisms such as *Staphylococcus aureus* cannot grow to levels sufficient to produce biologically effective concentrations of toxin in the food. This is exemplified in EU regulations where food safety criteria for milk powder and some cheeses specify that only when levels of coagulase positive *staphylococci* exceed 10^5 CFU/g, there is a requirement to test for enterotoxin content (Adams 2014).

Lactic acid fermentation

Lactic acid is produced by many microorganisms of which the most known are LAB belonging to genera former *Lactobacillus* genus, *Leuconostoc*, *Pediococcus*, *Lactococcus* and *Streptococcus* (Crowley, Mahony and van Sinderen 2013).

There are three different pathways leading to production of lactic acid from glucose (lactose); substrate level phosphorylation (homofermentative process) leading to production of two molecules of lactic acid from one of glucose; 6P-Gluconate pathway (heterofermentative process) leading to production of one molecule of lactate, ethanol and carbon dioxide from one molecule of glucose; and the Bifidus pathway leading to production of two molecules of lactate and three acetate from two molecules of glucose (Kandler 1983). The produced acid is in the form of L(+), D(-) or as racemic lactic acid D(-) and L(+). The production and secretion of lactic acid and other weak organic acids results in an acidic environment which generally restricts growth of both bacteria and fungi, including many pathogenic and spoilage microbes (Ross, Morgan and Hill 2002). Acid production and a simultaneous reduction in pH are inevitable consequences of LAB growth, and acidity levels in some fermentations can exceed 100 mM, reducing the pH to below 4.0 in weakly buffered systems (Adams and Mitchell 2002).

The rate of pH drops and the final pH value in lactic acid fermentations depend on a number of factors such as the buffering capacity and water activity of the medium, the temperature and duration of fermentation, the inoculum size and the metabolic activity of the bacteria. Ideally, the target pH would be around 4.5, although this is not achieved in many common fermented foods such as cheese. Even in very weakly buffered media, the pH would tend to level off around 3.8 as lactic acid production produces a lactate buffer. Maximum effect will also be achieved if the pH drop occurs rapidly, within hours, to prevent any pathogen growth occurring (Adams 2014).

Acetic acid fermentation

The microorganisms oxidizing ethanol to acetic acid are commonly called acetic acid bacteria (AAB). Acetic acid bacteria are mesophilic obligate aerobes that oxidize sugars, sugar alcohols and ethanol, with the production of acetic acid as the major end-product. During acetic acid production, ethanol is almost quantitatively oxidized to acetic acid. Acetic acid bacteria exhibit resistance to high acetic acid concentrations and low pH (Raspor and Goranovič 2008; Yamada and Yukphan 2008). Physiologically, bacteria belonging to the genus *Acetobacter* sp. convert alcohols to acids by oxidation.

Propionic acid fermentation

Propionic acid bacteria (PAB) are combined into the family *Propionibacteriaceae*, genus *Propionibacterium* and *Acidipropionibacterium*. They are isolated from milk, fermented dairy products and cheese; they are also found in at least 24 different vegetables and fruits species (Vorobjeva, Khodjaev and Vorobjeva 2008).

Depending on the strains, the ratio of PA to AA can vary widely and well beyond theoretical 3:1. Their product, PA alone or with AA, is inhibitory toward *Aspergillus flavus*, aerobic *Bacillus*, *Salmonella* spp. and yeasts and has been used as a mould inhibitor for animal feed, wet corn, silage and grain (Balamurugan, Venkata and Panda 1999) as well as in the food industry to prevent spoilage of foods such as bread and cake from moulding.

ECOLOGICAL COMPETITION

Microorganisms inhabit almost every environment in the world, including different food matrices. Interactions between different microorganisms are unavoidable and can either be symbiotic or competitive. Mechanisms of interaction include e.g. the production of inhibitory molecules and the competition for nutrients. Andreevskaya *et al.* (2018) showed that *Leuconostoc gelidum*, a spoilage LAB, in packaged cold-stored meat products enhanced its nutrient-scavenging capabilities in the presence of *Lactococcus piscium* and *Paucilactobacillus oligofermentans* by upregulation of carbohydrate catabolic pathways, pyruvate fermentation enzymes and ribosomal proteins. The slower growing *Lc. piscium* and *P. oligofermentans* downregulated these functions in the presence of *Le. gelidum*, but overexpressed prophage genes and restriction modification systems, which are mechanisms of DNA exchange and protection against it (Andreevskaya *et al.* 2018). Several studies on growth competition of spoilage organisms and potential bioprotective strains in media or food models exist. The mechanism of action responsible for growth inhibition is unfortunately often not examined. As an example: Leyva Salas *et al.* (2018) tested the antifungal activity of 32 LAB strains against the four fungi *Penicillium commune*, *Mucor racemosus*, *Galactomyces geotrichum* and *Yarrowia lipolytica* to find a combination of food cultures, which has a bioprotective effect without influencing the organoleptic properties nor inhibiting starter cultures of the respective foods. They used a cheese and yogurt model system and received different outcomes for the respective cultures in the different models, showing that food matrix and production conditions play a significant role in determining antifungal activity of potential bioprotective food cultures.

A way for microorganisms to colonize a favourable environment is either to colonize this environment as soon as it is available, e.g. through fast growth, or to actively displace already existing microorganisms, e.g. by production of antimicrobial compounds (Hibbing *et al.* 2010). When considering antifungal activity of LAB, many studies have revealed that antifungal compounds are often found in concentrations below the minimal inhibitory concentration (MIC), thus pointing out that other mechanisms must be responsible for the bioprotective effects of LAB against yeasts and moulds as well (Siedler, Balti and Neves 2019). The competition for limited resources, for example nutrients, carbon source and essential ions, can result in inhibition or delay of growth of either protective cultures or spoilage organisms. Honoré *et al.* (2016) found that the inhibition of *Penicillium* spp. by *Lacticaseibacillus*. *paracasei* (formerly *Lactobacillus paracasei*) in a defined medium was not only induced by metabolite formation, but also by nutrient consumption, especially by the consumption of glucose and glutamine. Reduced glucose availability induced by *Penicillium chrysogenum* growth was also assumed to be the reason for repressed Ochratoxin A (OTA) production of *Penicillium nordicum* (Delgado *et al.* 2019).

Furthermore, nitrogen is a limiting factor for microbial growth in dairy-based systems. Micro-organisms initially compete for free amino acids and small peptides, while they compete for peptides in later stages of fermentation. The ability to utilize amino acids efficiently is essential for growth of the respective microorganism (reviewed in Sieuwerts *et al.* 2008). Transcriptome analysis was used to study the interactions of *Lc. lactis* and *Saccharomyces cerevisiae* in coculture during the exponential growth phase. Whereas the lactic acid concentration was the same in a single culture of *Lc. lactis* and in the mixed culture of *Lc. lactis* and *S. cerevisiae*, ethanol concentration and glucose consumption were increased in the mixed culture. Also, pyrimidine metabolism of *Lc. lactis* was reoriented, most likely regulated by the ethanol production of the yeast (Maligoy *et al.* 2008).

Manganese was found to be the limiting factor for dairy yeast and mould growth in yogurt with *Lacticaseibacillus rhamnosus* (formerly *Lactobacillus rhamnosus*) and *Lb. paracasei* as protective food cultures (Siedler *et al.* 2020). The manganese transporter (MntH1) is responsible for manganese uptake under acidic conditions and gives strains expressing the mntH1 gene the ability to take up manganese. The resulting manganese depletion ends up in delayed yeast and mould growth. Homologues of the mntH1 gene were found in 15 different *Lactobacillus* species, indicating that this mechanism of competitive exclusion could be a general mechanism of LAB to interfere with yeast and mould growth (Siedler *et al.* 2020).

Iron is another nutrient which is fundamental to bacterial growth and thus a benefit for some micro-organisms if they are able to produce iron scavenging molecules, so called siderophores, to acquire iron from the environment (Hibbing *et al.* 2010). This has been shown for ripening bacteria on the surface of smear-ripened cheese. The addition of either iron or the siderophore desferrioxamine B stimulated growth of *Arthrobacter* spp., *Corynebacterium* spp. and *Brevibacterium* spp. Furthermore, genes for iron-siderophore transporter binding proteins of *Arthrobacter arilaitensis* were upregulated when the siderophore was added, but not when iron was added to the medium (Monnet, Back and Irlinger 2012). Sipiczki (2006) hypothesized that contrary to bacterial siderophore production, *Metschnikowia* spp. inhibits growth of other micro-organisms by immobilizing iron in the medium due to formation of an insoluble pigment. Additionally, iron depletion by the biocontrol yeast *Metchnikowia pulcherrima* was successfully used to control the postharvest apple-pathogens Botrytis cinereal and Alternaria alternata during apple storage (Saravanakumar *et al.* 2008).

As soon as a microorganism encounters a favourable environment, binding and attachment are crucial to colonize the eological niche. Many pathogenic bacteria are secondary colonizers of biofilms (Giaouris *et al.* 2015). Shaping the biofilm present on food (e.g. smear cheese) or processing environment (e.g. stainless steel) through the application of protective cultures is a challenging but promising approach. As an example: Habimana *et al.* (2009) studied the attachment of *L. monocytogenes* on biofilms formed by different customized *L. lactis* strains and found that the adhesion of planktonic cells was almost prevented when exopolysaccharides were formed by the biofilm-forming cells, but the adhesion was increased when biofilms had a porous structure formed by chain-making strains.

FOOD CULTURES AND BIOPRESERVATION: INDUSTRIAL APPLICATIONS

In ancient times, food fermentation was a spontaneous event whose outcome was uncertain in terms of quality and safety. Nevertheless, it was a first step for improving the shelf life (Farnworth 2008). Through the centuries, the monitoring of this process regularly improved, from empirically developed good practices in households to a systematic documentation of HACCP procedures in modern food processing industry. Next to pasteurization, salting and other hurdles, the application of food cultures in traditional fermented foods such as yoghurt, cheese, fermented meat, vegetables, beer and wine is nowadays strongly established. There is also a trend towards the use of traditional biotechnology for developing new foods and beverages (Laranjo, Potes and Elias 2019). Food cultures produce a high variety of compounds, including organic acids, alcohol and aroma compounds, contributing to product texture, taste and safety. This biopreservation contribution to safety meets the growing demand of the consumers for minimally processed food products.

The application of food cultures, which is widespread in dairy, meat and vegetable products, is already a form of biopreservation, but the addition of protective food cultures with a better productive effect can add another hurdle against pathogens or spoilage organisms. This is especially the case for fresh and RTE food products which lack a heating treatment and contain therefore potential spoilage organisms.

Applied research in the area of protective effect of food cultures is a challenging task. Between the discovery of an inhibitory activity in synthetic media and a commercially available food culture, a protective food culture has to pass the so-called challenge tests. It is thereby inoculated in a given food matrix together with the target microorganism and evaluated for the ability to reduce or control the outgrowth of the target organism over the desired shelf life. Applied research has been carried out extensively in the last two decades focusing on inhibition of pathogenic microorganisms such as *L. monocytogenes*, *Salmonella* sp., Shigatoxin producing *Escherichia coli* and *Staphylococcus aureus* as well as spoilage microorganisms such as yeasts, moulds and *Clostridium* species (Settani *et al.* 2008; Castellano *et al.* 2017; Leyva Salas *et al.* 2017; Bosse Née Danz *et al.* 2018; Oliveira *et al.* 2018; Silva, Silva and Ribeiro 2018; Laranjo, Potes and Elias 2019; Rouse and van Sinderen 2008). Well-adapted microorganisms will provide a more efficient protection with more effective inhibitory microorganisms often being isolated from the investigated food itself (Austin-Watson, Grant and Brice 2013; Lee *et al.* 2016; Scatasa *et al.* 2017). However, care must be taken that those cultures do not have a negative impact on the organoleptic characteristics of the end-product.

Studies covering a wide range of foods including all fermented foods listed above as well as non-fermented foods are presented below.

Dairy products

As first line of defence, fermented dairy products are preserved through the acidification carried out by food cultures, as illustrated by the high safety of yoghurt. Thanks to its low pH, yoghurt is only susceptible to yeast and moulds (Leyva Sala *et al.* 2017), but recently a general mechanism of LAB to also inhibit yeast and mould growth was discovered (Siedler *et al.* 2020). The careful selection of strains constituting mesophilic food culture of mildly acidified products such as cheese can already substantially increase the protection against pathogens and spoilage agents, as extensively shown for the species *L. lactis* (Silva, Silva and Ribeiro 2018). The applications mainly cover the protection against *L. monocytogenes* and *Clostridium tyrobutyricum* (Garde *et al.* 2011; Kondrotiene *et al.* 2018; Lianou and Samelis 2014; Samelis and Kakouri 2018). *Lactobacillus* spp. and *Enterococcus* spp. as an adjunct culture may also increase food safety (Cocolin *et al.* 2007; Martinez *et al.* 2015). Raw milk soft cheeses are highly sensitive to contamination by gram-negative bacteria such as *Salmonella* spp. and Shigatoxin producing *E. coli*. Application of LAB together with the gram-negative species *Hafnia alvei* was shown to protect those cheese types (Callon, Arliguie and Montel 2016). Non-fermented dairy products such as cottage cheese also benefit from the addition of selected protective food cultures as shown by numerous studies (Silva, Silva and Ribeiro 2018; Chhetri, Prakitchaiwattana and Settachaimongkon 2019).

By analogy to bioprotection observed in traditional fermented food, a combination of strains is often more powerful than a single strain (Aljasir *et al.* 2020; Aljasir and D'Amico 2020; Rodriguez *et al.* 2012; Chhetri, Prakitchaiwattana and Settachaimongkon 2019; Sindi *et al.* 2020).

While research mainly focuses on LAB, further microorganisms isolated from the food microbiota may also contribute to food safety. One research field focuses on the rind of ripening cheeses that may support survival of pathogens (Roth *et al.* 2011; Imran *et al.* 2013; Callon *et al.* 2014). As the biodiversity of rind microbiota is by far higher than the core microbiota, the development of future protective food cultures relies on a deep understanding of the species interactions in this habitat. In many cases, such added food cultures produce inhibitory compounds against various pathogens or spoilage bacteria, but in certain cases a combined effect of the starter together with the protective food culture inhibits growth. In many cases, *L. lactis* subsp. *lactis* is involved either as protective food culture or as starter culture (Kondrotiene *et al.* 2018), but other species such as *Latilactobacillus sakei* (formerly *Lactobacillus sakei*) or *Enterococcus* spp. can also be used and this demonstrates that no regulatory difference should be made (Cocolin *et al.* 2007; Martinez *et al.* 2015). Another application is the use against *Staphylococcus aureus* (Aljasir and D'Amico 2020). In certain cheeses such as cottage cheese, halophilic food cultures can be used also against *S. aureus* (Chhetri, Prakitchaiwattana and Settachaimongkon 2019).

The prevention of growth of *Salmonella* spp. in dairy products can also be achieved using specific cultures added to dairy products. *Salmonella* spp. was inhibited in cheese using a *Hafnia alvei* food culture, and the same authors showed the increased inhibitory effect of the combination of selected food cultures against *L. monocytogenes* (Callon, Arliguie and Montel 2016; Aljasir *et al.* 2020).

A combination of several species/strains for the inhibition of pathogens, which was usually the case in the early days of fermentation, can enhance the antimicrobial activity due to either increased inhibitory power of a wider range of target organisms. This is, for example, the case for kefir products which has been described to have antimicrobial properties attributed to its low pH and specific antimicrobial substances produced during the fermentation process (Kim *et al.* 2016; Sindi *et al.* 2020).

Meat and fish products

There are various hurdles used to preserve meat and fish products, including addition of salt, nitrite, starter cultures, smoking and cold storage. There is increasing evidence that protective food cultures may also play a significant role against *L. monocytogenes*, toxin-producing *Staphylococcus aureus* and further pathogenic and spoilage microorganisms (Castellano *et al.* 2017; Bosse Née Danz *et al.* 2018; Oliveira *et al.* 2018; Laranjo, Potes and Elias 2019; Aljasir *et al.* 2020). In meat, nitrite is a salt with potential toxic effects, and there is pressure to reduce its use. A combination of nitrite with a protective food culture demonstrated a higher reduction of *L. monocytogenes* in fermented sausages than without the addition of the protective food culture (Nikodinoska *et al.* 2019). The combined effect of food cultures has been shown to inhibit Ochratoxin A production in dry cured ham by *Penicillium chrysogenum* and *Debaryomyces hansenii* (Cebrian *et al.* 2019).

Since fish and meat are not sterile (Just like RTE Food products), their own microbiota will be active during storage. Psychrophilic microbiota already present on meat and fish such as *Carnobacterium* spp. and *Lactococcus piscium* can inhibit growth of pathogenic and spoilage bacteria. This is very promising, but careful selection of strains has to be carried out, as those highly adapted species will either spoil or protect the product, depending on their strain-specific phenotypes. (Castellano *et al.* 2017; Zhang, Gänzle and Yang 2019; Bazarnova *et al.* 2020)

Vegetables and cereal products

Moulds are the major spoilage issue when it comes to preservation of vegetables and cereal products. For a detailed overview of antifungal protective cultures in this type of food, we suggest reading the following recent review (Leyva Salas *et al.* 2017).

Listeria monocytogenes is also a pathogen of concern for vegetables. The application of protective cultures can be either directly on the product or through the washing process. Ramos *et al.* (2020) showed that a *Pediococcus pentosaceus*, prevented *Listeria* sp. proliferation in vegetable. In cabbage, the application of a *Lactiplantibacillus plantarum* (formerly *Lactobacillus plantarum*) strain reduced *L. monocytogenes* but showed at the same time that it is also important to synchronize all hurdles since the absence of oxygen increased the resistance of *L. monocytogenes* against *L. plantarum* (Dong *et al.* 2020).

Sourdough bread is a fermented product using yeasts and LAB. This microbiota can naturally protect the product from spoilage such as moulds (Chavan and Chavan 2011). In the case where the fermentation process for bread is mainly dominated by yeast, the addition of specific LAB food cultures enables the inhibition of for example *Aspergillus* spp., *Penicillium* spp. and *Fusarium culmorum* (Russo *et al.* 2017), thereby increasing safety (reduction of mycotoxins) and quality (reduction of off-flavour).

Industrial protective food cultures

Thanks to extensive scientific investigation in the last decades, food producers start to have access to protective cultures specifically developed to control a given pathogenic or spoilage microorganism in a given food. Compared to the tremendous number of studies dedicated to the development of protective food cultures illustrated above, there are still only a few available on the market. One cause may be that the protective food culture has to fit into an already intricate hurdle concept. Therefore, models used in future investigations should be as close as possible to the real processing conditions. In particular, care must be taken for commercial bioprotective food cultures not to have a negative impact on the organoleptic characteristics of the product. The regulation of use and declaration of protective cultures nevertheless remains an intricate topic for regulators in some regions/countries. The protective and preservation effects are seen as a key new effect of food cultures and it is regarded as belonging to food additive.

SAFETY DEMONSTRATION OF FOOD CULTURES FOR THEIR BIOPROTECTION ACTIVITIES

There is currently no firmly established regulation for the safety assessment of live micro-organisms added to food products as cultures or ingredients. However, there are a number of guidelines, recommendations and expert reviews on possible steps to document and validate the safety of live microorganisms used in foods independent of the mode of action of the food cultures (Laulund *et al.* 2017). Most industrial food strains used today are bacteria from species with a history of use in food products without apparent adverse effects. Four types of investigations have been proposed as further detailed.

Opportunistic infections

Commensal bacteria have been described to cause infections in patients with underlying disease (Berg and Garlington 1979; Berg 1985,1995). Owing to its natural presence in different sites of the human body and in fermented food products, the genus *Lactobacillus* has gained particular attention. *Lactobacillus* infections occur at a very low rate in the generally healthy population – estimated 0.5/1 million per year (Borriello *et al.* 2003; Bernardeau, Guguen and Vernoux 2006). As stated in two reviews of *Lactobacillus* infections: 'Underlying disease or immunosuppression are common features in these cases, whereas infection in previously healthy humans is extremely rare' (Aguirre and Collins 1993), and '*Lactobacillus* bacteraemia is rarely fatal per se but serves as an important marker of serious underlying disease' (Husni *et al.* 1997) sporadic infections have been reported in immunocompromised patients. The underlying problems have mainly been central venous catheter (CVC) in place, metabolic disorders, organ failure, or invasive procedures as dental work (Axelrod *et al.* 1973; Liong 2008). Infections by other bacterial species used as food cultures are also extremely rare (Horowitz *et al.* 1987; Barton, Rider and Coen 2001; Mofredj, Bahloul and Chanut 2007; Leuschner *et al.* 2010).

Infections with the commonly used yeast and mould species are rare events as well (Enache-Angoulvant and Hennequin 2005). Most of the infections are due to opportunistic pathogens not recognized as food cultures and affect immunocompromised patients and hospitalized patients (Jacques and Casaregola 2008; Miceli, Diaz and Lee 2011). In the 2018 re-evaluation EFSA concluded: 'The safety concerns described are all considered linked to severe underlying health conditions and therefore do not change the consideration of Lactobacillus spp. for the QPS status' (EFSA 2018).

Toxic metabolites and virulence factors

Biogenic amine formation in fermented foods by LAB has recently been reviewed (Spano *et al.* 2010). Following food poisoning outbreaks (Sumner *et al.* 1985), metabolic pathways have been elucidated (Straub *et al.* 1995) and screening procedures proposed to limit the level of production (Bover-Cid and Holzapfel 1999, Bover-Cid, Izquierdo-Pulido and Vidal-Carou 2000).

The presence of mycotoxin genes also raises safety concerns, although the level of expression within fermented food is very unlikely to cause any health hazard (Barbesgaard, Heldt-Hansen and Diderichsen 1992). Within fungi, the potential for antibiotic production is also an undesired property.

The occurrence of virulence traits should not be present in microorganisms used in a food fermentation. A specific risk assessment should be conducted on strains presenting these undesirable properties, even if they belong to a species with a long history of use (Semedo *et al.* 2003a, b).

Antibiotic resistance

The emergence and spread of antibiotic resistance are a major global health concern. The on-going Codex ad hoc intergovernmental task force on antimicrobial resistance is focused on the non-human use of antimicrobials. Microorganisms intentionally added to food and feed for technological purposes have not been shown to aggravate the problem of spreading antibiotic resistant pathogens (Anonymous 2011).

Intrinsic resistance or resistance that is caused by mutation in an indigenous gene not associated with mobile elements would represent a very low risk of dissemination (Saarela *et al.* 2007). Acquired antibiotic resistance genes, especially when associated with mobile genetic elements (plasmids, transposons), can be transferred to pathogens or other commensals along the food chain from within the product until consumption (FEEDAP 2005, 2008; Nawaz *et al.* 2011).

The role of microorganisms in the spread of antibiotic resistance has been assessed in fermented foods (Nawaz *et al.* 2011). Results of such studies confirm the role of a reservoir of antibiotic resistance genes from the food microbiota, without identifying any major health concerns to date.

It is considered that strains carrying acquired antibiotic resistance genes might act as a reservoir of transmissible antimicrobial resistance determinants (FEEDAP 2005, 2008). Gene transfer of antibiotic resistance between microorganisms in the food and feed chain is thus considered to be a topic of surveillance for the safety demonstration of microorganisms (Borriello *et al.* 2003; Gueimonde *et al.* 2005).

Definition of 'History of use'

The concept of 'history of safe use' has appeared recently in regulations and in safety assessment guidance. One definition of 'history of safe use' proposes ''significant human consumption of food over several generations and in a large, genetically diverse population for which there exist adequate toxicological and allergenicity data to provide reasonable certainty that no harm will result from consumption of the food'' (Health Canada 2003). In order to evaluate the history of safe use of a microorganism, it is necessary to document not just the occurrence of a microorganism in a fermented food product, but also to provide evidence of whether the presence of the microorganism is beneficial, fortuitous, or undesired.

CONCLUSION

Biopreservation of a food product can be achieved by fermentation, in a targeted or untargeted way. While the different bacteriocins described (mostly from LAB) show a dedicated mechanism to ensure primarily the survival in an ecosystem of a microbial species, but serve also as an additional hurdle to ensure safe food, other metabolic pathways, such as acidification, most specifically preserve initially short life stable food matrices (uninoculated milk get spoiled within hours). The initial empiric use of fermentation in the food chain was done for extended shelf life and avoiding food waste and food lost. Adaptation to texture and sensorial properties came after. The consumer has adapted its taste preferences to the different food cultures, and what is fermented food for one population and part of its culture can be considered spoiled if not dangerous by others.

Biopreservation itself can be ensured by other biological mechanisms than fermentation that were not considered in the present review. They would require a different approach, both for usage and safety demonstration. The potential of application of food cultures for biopreservation should not be considered something 'new' *per se* requiring a specific regulation and application process. It remains a traditional use of food cultures in the food chain, most presumably its first use. The focus in the initial steps of food microbiology on the sensorial properties has had a counterproductive effect on the application of food cultures for other applications. Fermentation applied to biopreservation should not be understood as a new approach, but one that time made us forget. Its potential as an additional hurdle to tackle food waste in combination with the numerous control measures already in place should not be underestimated. Enabling the delivering of safe, stable and tasty foods fitting in a sustainable lifestyle.

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Food Cultures to address eventual concern regarding the safe use of microorganisms in fermented foods.

Conflicts of Interest. None declared.

REFERENCES

Adams M, Mitchell R. Fermentation and pathogen control: a risk assessment approach. *Int J Food Microbiol* 2002;**79**:75–83.

Adams MR, Nicolaides L. Review of the sensitivity of different foodborne pathogens to fermentation. *Food Control* 2008;**8**:227–39.

Adams MR. Acids and Fermentation. In *Food Safety Management – A Practical Guide for the Food Industry ed.* Yasmine Motarjemi and Huub Lelieveld, Elsevier, 2014, 467–79. DOI: 10.1016/B978-0-12-381504-0.00019-6.

Aguirre M, Collins MD. Lactic acid bacteria and human clinical infection. *J Appl Bacteriol* 1993;**75**:95–107.

Aljasir SF, D'Amico DJ. The effect of protective cultures on *Staphylococcus aureus* growth and enterotoxin production. *Food Microbiol* 2020;**91**:103541. DOI: 10.1016/j.fm.2020.103541.

Aljasir SF, Gensler C, Sun L *et al.* The efficacy of individual and combined commercial protective cultures against *Listeria monocytogenes*, *Salmonella*, O157 and non-O157 shiga toxin-producing *Escherichia* coli in growth medium and raw milk. *Food Control* 2020;**109**:106924. DOI: 10.1016/j.foodcont.2019.106924.

Andreevskaya M, Jääskeläinen E, Johansson P *et al.* Food spoilage-associated *Leuconostoc*, *Lactococcus*, and *Lactobacillus* species display different survival strategies in response to competition. *Appl Environ Microbiol* 2018;**84**:e00554–18.

Anonymous. *Codex Alimentarius Guidelines for Risk Analysis of Foodborne Antimicrobial Resistance. CAC/GL 77–2011*, 2011, 1–29. Available at: (August 2020) www.fao.org/input/download/standards/11776/CXG_077e.pdf.

Austin-Watson C, Grant A, Brice M. Suppression of *Listeria monocytogenes* by the Native Micro-Flora in Teewurst Sausage. *Foods* 2013;**2**:478–87.

Axelrod J, Keusch GT, Bottone E *et al.* Endocarditis caused by *Lactobacillus plantarum*. *Annales Internes de Médecine* 1973;**78**:33–7.

Baka M, Fernández EN, Mertens L *et al.* Protective role of indigenous *Leuconostoc carnosum* against *Listeria monocytogenes* on vacuum-packed Frankfurter sausages at suboptimal temperatures. *Food Res Int* 2014;**66**:197–206.

Balamurugan K, Venkata DV, Panda T. Propionic acid production by whole cells of *Propionibacterium freudenreichii*. *Bioprocess Eng* 1999;**20**:109–16.

Barbesgaard P, Heldt-Hansen HP, Diderichsen B. On the safety of *Aspergillus oryzae*: a review. *Appl Microbiol Biotechnol* 1992;**36**:569–72.

Barron FH, Fraser AM. Acidified foods: food safety considerations for food processors. In: Muzzalupo Innocenzo (ed). *Food Industry* 2012, 231–9.

Barton LL, Rider ED, Coen RW. Bacteremic infection with *Pediococcus*: vancomycin-resistant opportunist. *Pediatrics* 2001;**107**:775–6.

Bazarnova J, Korableva N, Ozerova O *et al.* Biochemical composition and quality of herring preserves with addition of bioprotective cultures. *Agron Res* 2020;**18**:1629–39.

Bech Hansen E. Commercial bacterial starter cultures for fermented foods of the future. *Int J Food Microbiol* 2002;**78**:119–31.

Ben Said L, Gaudreau H, Dallaire L *et al.* Bioprotective culture: a new generation of food additives for the preservation of food quality and safety. *Ind Biotechnol* 2019;**15**:138–47. DOI: 10.1089/ind.2019.29175.lbs.

Berg RD, Garlington AW. Translocation of certain indigenous bacteria from the gastrointestinal tract to the mesenteric lymph nodes and other organs in a gnotobiotic mouse model. *Infect Immun* 1979;**23**:403–11.

Berg RD. Bacterial translocation from the gastrointestinal tract. *Trends Microbiol* 1995;**3**:149–54.

Berg RD. Bacterial translocation from the intestines. *Jikken Dobutsu* 1985;**34**:1–16.

Bernardeau M, Guguen M, Vernoux J. Beneficial lactobacilli in food and feed: long-term use, biodiversity and proposals for specific and realistic safety assessments. *FEMS Microbiol Rev* 2006;**30**:487–513.

Borriello SP, Hammes WP, Holzapfel W *et al.* Safety of probiotics that contain lactobacilli or bifidobacteria. *Clin Infect Dis* 2003;**36**:775–80.

Bosse Née Danz R, Müller A, Gibis M *et al.* Recent advances in cured raw ham manufacture. *Crit Rev Food Sci Nutr* 2018;**58**:610–30.

Bourdichon F, Casaregola S, Farrokh C *et al.* Food fermentations: microorganisms with technological beneficial use. *Int J Food Microbiol* 2012;**154**:87–97. DOI: 10.1016/j.ijfoodmicro.2011.12.030. Epub 2011 Dec 31. Erratum in: Int J Food Microbiol. 2012 Jun 1;156(3):301. PMID: 22257932.

Bover-Cid S, Holzapfel WF. Improved screening procedure for biogenic amine production by lactic acid bacteria. *Int J Food Microbiol* 1999;**53**:33–41.

Bover-Cid S, Izquierdo-Pulido M, Vidal-Carou MC. Mixed starter cultures to control biogenic amine production in dry fermented sausages. *J Food Prot* 2000;**63**:1556–62.

Callon C, Arliguie C, Montel MC. Control of Shigatoxin-producing *Escherichia coli* in cheese by dairy bacterial strains. *Food Microbiol* 2016;**53**:63–70.

Callon C, Retureau E, Didienne R *et al.* Microbial biodiversity in cheese consortia and comparative *Listeria* growth on surfaces of uncooked pressed cheeses. *Int J Food Microbiol* 2014;**174**:98–109.

Caplice E, Fitzgerald GF. Food fermentations: role of microorganisms in food production and preservation. *Int J Food Microbiol* 1999;**50**:131–49.

Castellano P, Pérez Ibarreche M, Blanco Massani M *et al.* Strategies for pathogen biocontrol using lactic acid bacteria and their metabolites: a focus on meat ecosystems and industrial environments. *Microorganisms* 2017;**5**:38.

Cebrián E, Rodríguez M, Peromingo B *et al.* Efficacy of the combined protective cultures of *Penicillium chrysogenum* and *Debaryomyces hansenii* for the control of ochratoxin A hazard in dry-cured ham. *Toxins* 2019;**11**:710.

Chavan RS, Chavan SR. Sourdough technology—a traditional way for wholesome foods: a review. *Comp Rev Food Sci Food Saf* 2011;**10**:170–83. DOI: 10.1111/j.1541-4337.2011.00148.x.

Chhetri V, Prakitchaiwattana C, Settachaimongkon S. A potential protective culture; halophilic *Bacillus* isolates with bacteriocin encoding gene against *Staphylococcus* aureus in salt added foods. *Food Control* 2019;**104**:292–9.

Cleusix V, Lacroix C, Vollenweider S *et al.* Inhibitory activity spectrum of reuterin produced by *Lactobacillus reuteri* against intestinal bacteria. *BMC Microbiol* 2007;**7**:101.

Cocolin L, Foschino R, Comi G *et al.* Description of the bacteriocins produced by two strains of *Enterococcus faecium* isolated from Italian goat milk. *Food Microbiol* 2007;**24**:752–8.

Corsetti A, M. Gobbetti M, Rossi J *et al*. Antimould activity of sourdough lactic acid bacteria: identification of a mixture of organic acids produced by Lactobacillus sanfrancisco CB1. *Appl Microbiol Biotechnol* 1998;**50**:253–6.

Crowley S, Mahony J, van Sinderen D. Current perspectives on antifungal lactic acid bacteria as natural bio-preservatives. *Trends Food Sci Technol* 2013;**33**:93–109.

Cui Y, Zhang C, Wang Y *et al*. Class IIa bacteriocins: diversity and new developments. *Int J Mol Sci* 2012;**13**:16668–707.

Dal Bello F, Clarke CI, Ryan LAM *et al*. Improvement of the quality and shelf life of wheat bread by fermentation with the antifungal strain *Lactobacillus plantarum* FST 1.7. *J Cereal Sci* 2007;**45**: 309–18.

De Kwaadsteniet M, Ten Doeschate K, Dicks LM. Characterization of the structural gene encoding nisin F, a new lantibiotic produced by a Lactococcus lactis subsp. lactis isolate from freshwater catfish (*Clarias gariepinus*). *Appl Environ Microbiol* 2008;**74**:547–9.

De Vos WM, Mulders JW, Siezen R.J *et al*. Properties of nisin Z and distribution of its gene, nisZ, in *Lactococcus lactis*. *Appl Environ Microbiol* 1993;**59**:213–8.

De Vuyst L, Leroy F. Bacteriocins from lactic acid bacteria: production, purification, and food applications. *J Mol Microbiol Biotechnol* 2007;**13**:194–9.

Delgado J, Núnez F, Asensio M.A *et al*. Quantitative proteomic profiling of ochratoxin A repression in *Penicillium nordicum* by protective cultures. *Int J Food Microbiol* 2019;**305**:108243.

Dieuleveux V, Lemarinier S, Guéguen M. Antimicrobial spectrum and target site of d-3-phenyllactic acid. *Int J Food Microbiol* 1998;**40**:177–83.

Dishisha T, Pereyra LP, Pyo SH *et al*. Flux analysis of the *Lactobacillus reuteri* propanediol-utilization pathway for production of 3-hydroxypropionaldehyde, 3-hydroxypropionic acid and 1,3-propanediol from glycerol. *Microb Cell Fact* 2014;**13**:76.

Dong Q, Zhang W, Guo L *et al*. Influence of *Lactobacillus plantarum* individually and in combination with low O2-MAP on the pathogenic potential of *Listeria monocytogenes* in cabbage. *Food Control* 2020;**107**:106765. DOI: 10.1016/j.foodcont.2019.106765.

Doores S. Organic acids. In B. A. L. Davidson P.M. (Ed.), *Antimicrobials in Foods*. 3rd edn Marcel Dekker Inc, New York, NY, 2005, 95–136.

Drosinos EH, Mataragas M, Metaxopoulos J Biopreservation: a new direction towards food safety. In *New Developments in Food Policy, Control and Research*. ed. Riley, A.P. Nova Science Publishers. 2005.

EFSA BIOHAZ Panel (EFSA Panel on Biological Hazards), Ricci A, Allende AEFSA BIOHAZ Panel (EFSA Panel on Biological Hazards) *et al*. Statement on the update of the list of QPS-recommended biological agents intentionally added to food or feed as notified to EFSA 7: suitability of taxonomic units notified to EFSA until September 2017. *EFSA Journal* 2018;**16**:5131, 43 pp.

Elsser-Gravesen D, Elsser-Gravesen A. Biopreservatives. *Adv Biochem Eng Biotechnol* 2014;**143**:29–49.

Enache-Angoulvant A, Hennequin C. Invasive *Saccharomyces* infection: a comprehensive review. *Clin Infect Dis* 2005;**41**:1559–68.

Farnworth ER. Handbook of fermented functional foods. In: Mazza G (ed.). *Functional Foods and Nutraceuticals Series*, 2nd edn. Boca Raton: CRC Press Taylor & Francis Group. 2008.

FEEDAP. Opinion of the scientific panel on additives and products or substances used in animal feed (FEEDAP) on the updating of the criteria used in the assessment of bacteria for resistance to antibiotics of human or veterinary importance. *EFSA J* 2005;**223**:1–12.

FEEDAP. Technical guidance - Update of the criteria used in the assessment of bacterial resistance to antibiotics of human or veterinary importance. *EFSA J* 2008;**732**:1–15.

Gaggia F, Di Gioia D, Baffoni L *et al*. The role of protective and probiotic cultures in food and feed and their impact on food safety. *Trends Food Sci Technol* 2011;**22**:S58–66.

Garai-Ibabe G, Ibarburu I, Berregi I *et al*. Glycerol metabolism and bitterness producing lactic acid bacteria in cidermaking. *Int J Food Microbiol* 2008;**121**:253–61.

Garde S, Avila M, Arias R *et al*. Outgrowth inhibition of *Clostridium beijerinckii* spores by a bacteriocin-producing lactic culture in ovine milk cheese. *Int J Food Microbiol* 2011;**150**: 59–65.

Ge X, Teng K, Wang J *et al*. Identification of Key Residues in the NisK Sensor Region for Nisin Biosynthesis Regulation. *Front Microbiol* 2017;**08**:106.

Giaouris E, Heir. E, Desvaux M *et al*. Intra- and inter-species interactions within biofilms of important foodborne bacterial pathogens. *Front Microbiol* 2015;**6**:841.

Gross E, Morell JL. The structure of nisin. *J Am Chem Soc* 1971;**93**:4634–5.

Gueimonde M, Ouwehand AC, Salminen S. Safety of Probiotics. *Scand J Nutr* 2005;**48**:42–8.

Guimaraes A, Abrunhosa L, Pastrana L.M *et al*. Edible films and coatings as carriers of living microorganisms: a new strategy towards biopreservation and healthier foods. *Comp Rev Food Sci Food Saf* 2018;**17**:594–614.

Habimana O, Meyrand M, Meylheuc T *et al*. Genetic features of resident biofilms determine attachment of *Listeria monocytogenes*. *Appl Environ Microbiol* 2009;**75**:7814–21.

Hammes WP, Tichaczek PS. The potential of lactic acid bacteria for the production of safe and wholesome food (Das Potential der Milchsäurebakterien bei der Produktion von hygienisch sicheren und gesundheitsfördernden Lebensmitteln). *Zeitschrift für Lebensmittel-Untersuchung und -Forschung* 1994;**198**:193–201.

Health Canada. *Amendment (Schedule No. 948) to Division 28 of the Food and Drug Regulations, Sections B.28.001–003*. Food and Drugs Regulations. 2003.

Hibbing ME, Fuqua C, Parsek M.R *et al*. Bacterial competition: surviving and thriving in the microbial jungle. *Nat Rev Microbiol* 2010;**8**:15–25.

Honoré AH, Aunsbjerg SD, Ebrahimi P *et al*. Metabolic footprinting for investigation of antifungal properties of *Lactobacillus paracasei*. *Anal Bioanal Chem* 2016;**408**:83–96.

Horowitz HW, Handwerger S, van Horn KG *et al*. *Leuconostoc*, an emerging vancomycin-resistant pathogen. *Lancet North Am Ed* 1987;**330**:1329–30.

Husni RN, Gordon SM, Washington J.A *et al*. *Lactobacillus* bacteremia and endocarditis: review of 45 cases. *Clin Infect Dis* 1997;**25**:1048–55.

Imran M, Bré JM, Guéguen M *et al*. Reduced growth of *Listeria monocytogenes* in two model cheese microcosms is not associated with individual microbial strains. *Food Microbiol* 2013;**33**:30–39.

Jacques N, Casaregola S. Safety assessment of dairy microorganisms: the hemiascomycetous yeasts. *Int J Food Microbiol* 2008;**126**:321–6.

Kandler O. Carbohydrate metabolism in lactic acid bacteria. *Antonie Van Leeuwenhoek* 1983;**49**:209–24.

Kawtharani H, Snini SP, Heang S *et al*. Phenyllactic acid produced by *Geotrichum candidum* reduces *Fusarium sporotrichioides* and

F. langsethiae growth and T-2 toxin concentration. *Toxins* 2020;**12**:209.

Kim DH, Jeong D, Kim H *et al*. Antimicrobial activity of Kefir against various food pathogens and spoilage bacteria. *Kor J Food Sci Anim Resour* 2016;**36**:787–90.

Kjos M, Oppegard C, Diep D.B *et al*. Sensitivity to the two-peptide bacteriocin lactococcin G is dependent on UppP, an enzyme involved in cell-wall synthesis. *Mol Microbiol* 2014;**92**:1177–87.

Kondrotiene K, Kasnauskyte N, Serniene L *et al*. Characterization and application of newly isolated nisin producing *Lactococcus lactis* strains for control of *Listeria monocytogenes* growth in fresh cheese. *LWT Food Sci Technol* 2018;**87**:507–14.

Kuipers OP, Beerthuyzen MM, Siezen RJ *et al*. Characterization of the nisin gene cluster nisABTCIPR of *Lactococcus lactis*. Requirement of expression of the nisA and nisI genes for development of immunity. *Eur J Biochem* 1993;**216**:281–91.

Lacroix N, St Gelais D, Champagne C.P *et al*. Characterization of aromatic properties of old-style cheese starters. *J Dairy Sci* 2010;**93**:3427–41.

Laranjo M, Potes ME, Elias M. Role of starter cultures on the safety of fermented meat products. *Front Microbiol* 2019;**10**:853.

Laulund S, Wind A, Derkx PMF *et al*. Regulatory and safety requirements for food cultures. *Microorganisms* 2017;**5**:28.

Lavermicocca P, Valerio F, Evidente A *et al*. Purification and characterization of novel antifungal compounds from the sourdough *Lactobacillus plantarum* strain 21B. *Appl Environ Microbiol* 2000;**66**:4084–90.

Lavermicocca P, Valerio F, Visconti A. Antifungal activity of phenyllactic acid against molds isolated from bakery products. *Appl Environ Microbiol* 2003;**69**:634–40.

Lee JY, Shim JM, Yao Z *et al*. Antimicrobial activity of *Bacillus amyloliquefaciens* EMD17 isolated from Cheonggukjang and potential use as a starter for fermented soy foods. *Food Sci Biotechnol* 2016;**25**:525–32.

Leuschner R-GK, Robinson T, Hugas M *et al*. Qualified presumption of safety (QPS): a generic risk assessment approach for biological agents notified to the European Food Safety Authority (EFSA). *Trends Food Sci Technol* 2010;**21**: 425–35.

Leyva Salas M, Mounier J, Valence F *et al*. Antifungal microbial agents for food biopreservation—a review. *Microorganisms* 2017;**5**:37.

Leyva Salas M, Thierry A, Lemaître M *et al*. Antifungal ativity of lactic acid bacteria combinations in dairy mimicking models and their potential as bioprotective cultures in pilot scale applications. *Front Microbiol* 2018;**9**:1787.

Li L, Shin SY, Lee KW *et al*. Production of natural antimicrobial compound D-phenyllactic acid using *Leuconostoc mesenteroides* ATCC 8293 whole cells involving highly active D-lactate dehydrogenase. *Lett Appl Microbiol* 2014;**59**: 404–11.

Li X, Jiang B, Pan B *et al*. Purification and partial characterization of Lactobacillus species SK007 lactate dehydrogenase (LDH) catalyzing phenylpyruvic acid (PPA) conversion into phenyllactic acid (PLA). *J Agric Food Chem* 2008;**56**:2392–9.

Li X, Jiang B, Pan B. Biotransformation of phenylpyruvic acid to phenyllactic acid by growing and resting cells of a *Lactobacillus* sp. *Biotechnol Lett* 2007;**29**:593–7.

Lianou A, Samelis J. Addition to thermized milk of *Lactococcus lactis* subsp. *cremoris* M104, a wild, novel nisin a-producing strain, replaces the natural antilisterial activity of the autochthonous raw milk microbiota reduced by thermization. *J Food Prot* 2014;**77**:1289–97.

Lin XB, Gänzle MG. Effect of lineage-specific metabolic traits of *Lactobacillus reuteri* on sourdough microbial ecology. *Appl Environ Microbiol* 2014;**80**:5782–9.

Liong MT. Safety of probiotics: translocation and infection. *Nutr Rev* 2008;**66**:192–202.

Lubelski J, Rink R, Khusainov R *et al*. Biosynthesis, immunity, regulation, mode of action and engineering of the model lantibiotic nisin. *Cell Mol Life Sci* 2008;**65**:455–76.

Magnusson J, Strom K, Roos S *et al*. Broad and complex antifungal activity among environmental isolates of lactic acid bacteria. *FEMS Microbiol Lett* 2003;**219**:129–35.

Makarova K, Slesarev A, Wolf Y *et al*. Comparative genomics of the lactic acid bacteria. *Proc Natl Acad Sci* 2006;**103**:15611–6.

Maligoy M, Mercade M, Cocaign-Bousquet M *et al*.. *Appl Environ Microbiol* 2008;**74**:485–94.

Mani-López E, García HS, López-Malo A. Organic acids as antimicrobials to control Salmonella in meat and poultry products. *Food Res Int* 2012;**45**:713–21.

Mannazzu I, Domizio P, Carboni G *et al*. Yeast killer toxins: from ecological significance to application. *Crit Rev Biotechnol* 2019. 10.1080/07388551.2019.1601679.

Marilley L, Casey MG. Flavors of cheese products: metabolic pathways, analytical tools and identification of producing strains. *Int J Food Microbiol* 2004;**90**:139–59.

Martín R, Olivares M, Marín ML *et al*. Characterization of a reuterin-producing *Lactobacillus coryniformis* strain isolated from a goat's milk cheese. *Int J Food Microbiol* 2005;**104**: 267–77.

Martinez RCR, Staliano CD, Vieira ADS *et al*. Bacteriocin production and inhibition of *Listeria monocytogenes* by *Lactobacillus sakei* subsp *sakei* 2a in a potentially synbiotic cheese spread. *Food Microbiol* 2015;**48**:143–52.

McAuliffe O, Ross RP, Hill C. Lantibiotics: structure, biosynthesis and mode of action. *FEMS Microbiol Rev* 2001;**25**:285–308.

Medina-Córdova N, Rosales-Mendoza S, Hernández-Montiel LG *et al*. The potential use of *Debaryomyces hansenii* for the biological control of pathogenic fungi in food. *Biol Control* 2018;**121**:216–22.

Miceli MH, Diaz JA, Lee SA. Emerging opportunistic yeast infections. *Lancet Infect Dis* 2011;**11**:142–51.

Mirkovic N, Radulovic Z, Uzelac G *et al*. Isolation and characterisation of bacteriocin and aggregation-promoting factor production in *Lactococcus lactis* ssp. *lactis* BGBM50 strain. *Food Technol Biotechnol* 2015;**53**:237–42.

Mofredj A, Bahloul H, Chanut C. *Lactococcus lactis*: an opportunistic bacterium? *Médecine et Maladies Infectieuses* 2007;**37**:200–7.

Moll G, Hauge HH, Nissen-Meyer J *et al*. Mechanistic properties of the two component bacteriocin lactococcin G. *J Bacteriol* 1998;**180**:96–99.

Moll G, Ubbink-Kok T, Hildeng-Hauge H *et al*. Lactococcin G is a potassium ion-conducting, two component bacteriocin. *J Bacteriol* 1996;**178**:600–5.

Monnet C, Back A, Irlinger F. Growth of aerobic ripening bacteria at the cheese surface is limited by the availability of iron. *Appl Environ Microbiol* 2012;**78**:3185–92.

Morata A, Escott C, Banuelos A *et al*. Contribution of Non-*Saccharomyces* yeasts to wine freshness. A review. *Biomolecules* 2020;**10**:34.

Morita H, Toh H, Fukuda S *et al*. Comparative genome analysis of *Lactobacillus reuteri* and *Lactobacillus fermentum* reveal a genomic island for reuterin and cobalamin production. *DNA Res* 2008;**15**:151–61.

Motarjemi Y, Nout MJR, Joint FAO/WHO Workshop on Assessment of Fermentation as a Household Technology for

Improving Food Safety. Food fermentation: a safety and nutritional assessment. *Bull World Health Organ* 1996;**74**: 553–9.

Mu W, Yang Y, Jia J *et al*. Production of 4-hydroxyphenyllactic acid by *Lactobacillus* sp. SK007 fermentation. *J Biosci Bioeng* 2010;**109**:369–71.

Muhialdin BJ, Algboory HL, Kadum H *et al*. Antifungal activity determination for the peptides generated by *Lactobacillus plantarum* TE10 against *Aspergillus flavus* in maize seeds. *Food Control* 2020;**109**:106898.

Nawaz M, Wang J, Zhou A *et al*. Characterization and transfer of antibiotic resistance in lactic acid bacteria from fermented food products. *Curr Microbiol* 2011;**62**:1081–9.

Nazareth TM, Luz C, Torrijos R *et al*. Potential application of lactic acid bacteria to reduce Aflatoxin B1 and Fumonisin B1 occurrence on corn kernels and corn ears. *Toxins* 2020;**12**:21.

Ndagano D, Lamoureux T, Dortu C *et al*. Antifungal activity of 2 lactic acid bacteria of the *Weissella* genus isolated from food. *J Food Sci* 2011;**76**:305–11.

Nes IF, Diep DB, Håvarstein LS *et al*. Biosynthesis of bacteriocins in lactic acid bacteria. *Antonie Van Leeuwenhoek* 1996;**70**: 113–28.

Nikodinoska I, Baffoni L, Di Gioia D *et al*. Protective cultures against foodborne pathogens in a nitrite reduced fermented meat product. *LWT* 2019;**101**:293–9.

Niku-Paavola ML, Laitila A, Mattila-Sandholm T *et al*. New types of antimicrobial compounds produced by *Lactobacillus plantarum*. *J Appl Microbiol* 1999;**86**:29–35.

Nissen-Meyer J, Holo H, Håvarstein L.S *et al*. A novel lactococcal bacteriocin whose activity depends on the complementary action of two peptides. *J Bacteriol* 1992;**174**:5686–92.

O'Sullivan JN, O'Connor PM, Rea MC *et al*. Nisin J, a novel natural Nisin variant, is produced by *Staphylococcus capitis* sourced from the human skin microbiota. *J Bacteriol* 2020;**202**: e00639–19.

Oliveira M, Ferreira V, Magalhães R *et al*. Biocontrol strategies for Mediterranean-style fermented sausages. *Food Res Int* 2018;**103**:438–49.

Oppegard C, Emanuelsen L, Thorbek L *et al*. The lactococcin G immunity protein recognizes specific regions in both peptides constituting the two-peptide bacteriocin lactococcin G. *Appl Environ Microbiol* 2010;**76**:1267–73.

Poutanen K, Flander L, Katina K Sourdough and cereal fermentation in a nutritional perspective. *Food Microbiol* 2009;**26**:693–9.

Prema P, Smila D, Palavesam A *et al*. Production and characterization of an antifungal compound (3-phenyllactic acid) produced by *Lactobacillus plantarum* strain. *Food Bioprocess Technol* 2010;**3**:379–86.

Ramos B, Brandão TRS, Teixeira P *et al*. Biopreservation approaches to reduce *Listeria monocytogenes* in fresh vegetables. *Food Microbiol* 2020;**85**:103282.

Raspor P, Goranovič D. Biotechnological applications of acetic acid bacteria. *Crit Rev Biotechnol* 2008;**28**:101–24.

Rodríguez JM, Martínez MI, Kok J. Pediocin PA-1, a wide-spectrum bacteriocin from lactic acid bacteria. *Crit Rev Food Sci Nutr* 2002;**42**:91–121.

Rodríguez N, Salgado JM, Cortés S *et al*. Antimicrobial activity of d-3-phenyllactic acid produced by fed-batch process against *Salmonella enterica*. *Food Control* 2012;**25**:274–84.

Rogne P, Fimland G, Nissen-Meyer J *et al*. Three-dimensional structure of the two peptides that constitute the two-peptide bacteriocin lactococcin G. *Biochim Biophys Acta* 2008;**1784**:543–54.

Ross RP, Morgan S, Hill C. Preservation and fermentation: past, present and future. *Int J Food Microbiol* 2002;**79**:3–16.

Roth E, Schwenninger SM, Eugster-Meier E *et al*. Facultative anaerobic halophilic and alkaliphilic bacteria isolated from a natural smear ecosystem inhibit *Listeria* growth in early ripening stages. *Int J Food Microbiol* 2011;**147**:26–32.

Rouse S, van Sinderen D. Bioprotective potential of lactic acid bacteria in malting and brewing. *J Food Prot* 2008;**71**:1724–33.

Russo P, Fares C, Longo A *et al*. *Lactobacillus plantarum* with broad antifungal activity as a protective starter culture for bread production. *Foods* 2017;**6**:1101–9.

Ryan LAM, Zannini E, Bello DF *et al*. *Lactobacillus amylovorus* DSM 19280 as a novel food-grade antifungal agent for bakery products. *Int J Food Microbiol* 2011;**146**:276–83.

Saarela M, Maukonen J, von Wright A *et al*. Tetracycline susceptibility of the ingested Lactobacillus acidophilus LaCH-5 and Bifidobacterium animalis subsp. lactis Bb-12 strains during antibiotic/probiotic intervention. *Int J Antimicrob Agents* 2007;**29**:271–80.

Salas ML, Mounier J, Valence F *et al*. Antifungal microbial agents for food biopreservation. A review. *Microorganisms* 2017;**5**:37.

Samelis J, Kakouri A. Hurdle factors minimizing growth of *Listeria monocytogenes* while counteracting in situ antilisterial effects of a novel nisin A-producing *Lactococcus lactis* subsp. *cremoris* costarter in thermized cheese milks. *AIMS Microbiol* 2018;**4**:19–41.

Santos F, Vera JL, van der Heijden R *et al*. The complete coenzyme B12 biosynthesis gene cluster of *Lactobacillus reuteri* CRL1098. *Microbiology* 2008;**154**:81–93.

Saravanakumar D, Ciavorella A, Spadaro D *et al*. *Metschnikowia pulcherima* strain MACH1 outcompetes *Botrytis cinereal*, *Alternaria alternata* and *Penicillium expansum* in apples through iron depletion. *Postharvest Biol Technol* 2008;**49**: 121–8.

Sauvageot N, Gouffi K, Laplace JM *et al*. Glycerol metabolism in *Lactobacillus collinoides*: production of 3-hydroxypropionaldehyde, a precursor of acrolein. *Int J Food Microbiol* 2000;**55**:167–70.

Sauvageot N, Muller C, Hartke A *et al*. Characterisation of the diol dehydratase pdu operon of *Lactobacillus collinoides*. *FEMS Microbiol Lett* 2002;**209**:69–74.

Scatassa ML, Gaglio R, Cardamone C *et al*. Anti-listeria activity of lactic acid bacteria in two traditional Sicilian cheeses. *Ital J Food Saf* 2017;**6**:6191.

Schaefer L, Auchtung TA, Hermans KE *et al*. The antimicrobial compound reuterin (3-hydroxypropionaldehyde) induces oxidative stress via interaction with thiol groups. *Microbiology* 2010;**156**:1589–99.

Schütz H, Radler F. Anaerobic reduction of glycerol to propanediol-1.3 by *Lactobacillus brevis* and *Lactobacillus buchneri*, *Syst Appl Microbiol* 1984;**5**:169–78.

Semedo T, Almeida SM, Martins P *et al*. Comparative study using type strains and clinical and food isolates to examine hemolytic activity and occurrence of the cyl operon in Enterococci. *J Clin Microbiol* 2003a;**41**:2569–76.

Semedo T, Santos MA, Lopes MF *et al*. Virulence factors in food, clinical and reference Enterococci: a common trait in the genus? *Syst Appl Microbiol* 2003b;**26**:13–22.

Settanni L, Corsetti A. Application of bacteriocins in vegetable food biopreservation. *Int J Food Microbiol* 2008;**121**:123–38.

Settanni L, Franciosi E, Cavazza A *et al*. Extension of Tosèla cheese shelf-life using non-starter lactic acid bacteria. *Food Microbiol* 2011;**28**:883–90.

Sicard D, Legras JL. Bread, beer and wine: yeast domestication in the *Saccharomyces sensu* strict complex. *C R Biol* 2011;**334**: 229–36.

Siedler S, Balti R, Neves AR. Bioprotective mechanisms of lactic acid bacteria against fungal spoilage of food. *Curr Opin Biotechnol* 2019;**56**:138–46.

Siedler S, Rau MH, Bidstrup S *et al.* Competitive exclusion is a major bioprotective mechanism of *lactobacilli* against fungal spoilage in fermented milk products. *Appl Environ Microbiol* 2020;**86**:e02312–19.

Sieuwerts S, de Bok FAM, Hugenholtz J *et al.* Unraveling microbial interactions in food fermentations: from classical to genomics approaches. *Appl Environ Microbiol* 2008;**74**: 4997–5007.

Silva CCG, Silva SPM, Ribeiro SC. Application of bacteriocins and protective cultures in dairy food preservation. *Front Microbiol* 2018;**9**:594. https://www.frontiersin.org/article/10.3389/fmicb.2018.00594.

Sindi A, Badsha MB, Nielsen B *et al.* Antimicrobial activity of six international Artisanal Kefirs against *Bacillus cereus*, *Listeria monocytogenes*, *Salmonella enterica* serovar *Enteritidis*, and *Staphylococcus aureus*. *Microorganisms* 2020;**8**:849.

Sipiczki M. *Metschnikowia* strains isolated from botrytized grapes antagonize fungal and bacterial growth by iron depletion. *Appl Environ Microbiol* 2006;**72**:6716–24.

Smit G, Smit BA, Engels WJ. Flavor formation by lactic acid bacteria and biochemical flavor profiling of cheese products. *FEMS Microbiol Rev* 2005;**29**:591–610.

Spano G, Russo P, Lonvaud-Funel A *et al.* Biogenic amines in fermented foods. *Eur J Clin Nutr* 2010;**64**:S95–100.

Sriramulu DD, Liang M, Hernandez-Romero D *et al. Lactobacillus reuteri* DSM 20016 produces cobalamin-dependent diol dehydratase in metabolosomes and metabolizes 1,2-propanediol by disproportionation. *J Bacteriol* 2008;**190**:4559–67.

Starmer WT, Ganter PF, Aberdeen V *et al.* The ecological role of killer yeasts in natural communities of yeasts. *Can J Microbiol* 1987;**33**:783–96.

Straub BW, Kicherer M, Schilcher SM *et al.* The formation of biogenic amines by fermentation organisms (Die Bildung von biogenen Aminen durch Fermentationsorganismen). *Zeitschrift für Lebensmittel-Untersuchung und Forschung* 1995;**201**:79–82.

Ström K, Sjögren J, Broberg A *et al. Lactobacillus plantarum* MiLAB 393 produces the antifungal cyclic dipeptides cyclo(l-Phe-l-Pro) and cyclo(l-Phe-trans-4-OH-l-Pro) and phenyl lactic acid. *Appl Environ Microbiol* 2002;**68**:4322–7.

Sumner SS, Speckhard MW, Somers EB *et al.* Isolation of histamine-producing Lactobacillus buchneri from Swiss cheese implicated in a food poisoning outbreak. *Appl Environ Microbiol* 1985;**50**:1094–6.

Sun D, Li H, Song D *et al.* Genome, transcriptome and fermentation analyses of *Lactobacillus plantarum* LY-78 provide new insights into the mechanism of phenyllactate biosynthesis in lactic acid bacteria. *Biochem Biophys Res Commun* 2019;**519**:351–7.

Talarico TL, Dobrogosz WJ. Purification and characterization of glycerol dehydratase from *Lactobacillus reuteri*. *Appl Environ Microbiol* 1990;**56**:1195–7.

Tarazanova M, Beerthuyzen M, Siezen R *et al.* Plasmid complement of *Lactococcus lactis* NCDO712 reveals a novel pilus gene cluster. *PLoS ONE* 2016;**11**:e0167970.

Valerio F, Di Biase M, Lattanzio VMT *et al.* Improvement of the antifungal activity of lactic acid bacteria by addition to the growth medium of phenylpyruvic acid, a precursor of phenyllactic acid. *Int J Food Microbiol* 2016;**222**: 1–7.

Valerio F, Lavermicocca P, Pascale M *et al.* Production of phenyllactic acid by lactic acid bacteria: an approach to the selection of strains contributing to food quality and preservation. *FEMS Microbiol Lett* 2004;**233**:289–95.

Van Boekel M, Fogliano V, Pellegrini N *et al.* A review on the beneficial aspects of food processing. *Mol Nutr Food Res* 2010;**54**:1215–47.

Van Gijtenbeek LA, Eckhardt TH, Herrera-Domínguez L *et al.* Gene-trait matching and prevalence of Nisin tolerance systems in *Lactococus lactis*. *Front Bioeng Biotechnol* 2021;**9**: 622835.

Vermeulen N, Ganzle MG, Vogel RF. Influence of peptide supply and cosubstrates on phenylalanine metabolism of *Lactobacillus sanfranciscensis* DSM20451T and *Lactobacillus plantarum* TMW1.468. *J Agric Food Chem* 2006;**54**: 3832–9.

Vollenweider S, Grassi G, Konig I *et al.* Purification and structural characterization of 3-hydroxypropionaldehyde and its derivatives. *J Agric Food Chem* 2003;**51**: 3287–93.

Vorobjeva L, Khodjaev EY, Vorobjeva NV. Propionic acid bacteria as probiotic. *Microb Ecol Health Dis* 2008;**20**:109–12.

Wels M, Siezen R, van Hijum S *et al.* Comparative genome analysis of *Lactococcus lactis* indicates niche adaptation and resolves genotype/phenotype disparity. *Front Microbiol* 2019;**10**:4.

Wilson PDG, Wilson DR, Waspe CR. Weak acids: dissociation in complex buffering systems and partitioning into oils. *J Sci Food Agric* 2000;**80**:471–6.

Wirawan RE, Klesse NA, Jack RW *et al.* Molecular and genetic characterization of a novel nisin variant produced by *Streptococcus uberis*. *Appl Environ Microbiol* 2006;**72**: 1148–56.

Wu W, Deng G, Liu C *et al.* Optimization and multiomic basis of phenyllactic acid overproduction by *Lactobacillus plantarum*. *J Agric Food Chem* 2020;**68**:1741–9.

Yamada Y, Yukphan P. Genera and species in acetic acid bacteria – a review. *Int J Food Microbiol* 2008;**125**:15–24.

Yvon M, Thirouin S, Rijnen L *et al.* An aminotransferase from *Lactococcus lactis* initiates conversion of amino acids to cheese flavor compounds. *Appl Environ Microbiol* 1997;**63**: 414–9.

Zendo T, Fukao M, Ueda K *et al.* Identification of the lantibiotic nisin Q, a new natural nisin variant produced by *Lactococcus lactis* 61-14 isolated from a river in Japan. *Biosci Biotechnol Biochem* 2003;**67**:1616–9.

Zhang P, Gänzle M, Yang X. Complementary antibacterial effects of bacteriocins and organic acids as revealed by comparative analysis of *Carnobacterium* spp. from meat. *Appl Environ Microbiol* 2019;**85**:e01227–01219.

Publication #4 – Safety demonstration of a microbial species for use in the food chain: *Weissella confusa*

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Due to their traditional use in food fermentation process for centuries, microbial food cultures are considered to have a safe history of use. A specific microbial risk assessment is therefore rarely conducted for fermented foods and their food cultures, inoculated or naturally present. Some of those food cultures have been also considered for their potential health effect as probiotic strain candidates, for which a specific safety demonstration process has been proposed by a joint expert report of FAO and WHO. The European Food Safety Authority (EFSA) Biohazard panel also provides an approach for evaluating the safety of a strain to be added in the food chain, the Qualified Presumption of Safety (QPS). *Weissella confusa*, former taxon *Lactobacillus confusus*, is a food culture characterized in the fermentation process of sourdough. Some strains have been recently proposed for their probiotic potential. The species is also documented in recent infection case reports. It is considered nevertheless to be opportunistic as underlying factors have been suggested to explain the infection. We report here the microbial risk assessment of the species, by studying a collection of 26 food and 17 clinical isolates of *Weissella confusa*. The phenotypic study, genomic characterization and bibliographical survey will allow us to conclude about the safety of the species and confirm its use for food fermentation and consider specific strains for demonstration of their respective health effects as probiotic candidates.

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Safety demonstration of a microbial species for use in the food chain: *Weissella confusa*

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ABSTRACT

Due to their traditional use in food fermentation process for centuries, microbial food cultures are considered to have a safe history of use. A specific microbial risk assessment is therefore rarely conducted for fermented foods and their food cultures, inoculated or naturally present. Some of those food cultures have been also considered for their potential health effect as probiotic strain candidates, for which a specific safety demonstration process has been proposed by a joint expert report of FAO and WHO. The European Food Safety Authority (EFSA) Biohazard panel also provides an approach for evaluating the safety of a strain to be added in the food chain, the Qualified Presumption of Safety (QPS). *Weissella confusa*, former taxon *Lactobacillus confusus*, is a food culture characterized in the fermentation process of sourdough. Some strains have been recently proposed for their probiotic potential. The species is also documented in recent infection case reports. It is considered nevertheless to be opportunistic as underlying factors have been suggested to explain the infection. We report here the microbial risk assessment of the species, by studying a collection of 26 food and 17 clinical isolates of *Weissella confusa*. The phenotypic study, genomic characterization and bibliographical survey will allow us to conclude about the safety of the species and confirm its use for food fermentation and consider specific strains for demonstration of their respective health effects as probiotic candidates.

1. Introduction

Fermentation is probably the first empirical food process in human history, tracing back to Neolithic period, circa 10,000 years ago. While fermentation in Europe is classically attributed by the consumer to dairy products, recent interest in the fermentation process for other food matrices have highlighted the diversity of fermented food products, which are estimated to represent a third of the food intake (Bourdichon et al., 2012).

Weissella confusa, former taxon *Lactobacillus confusus* (Collins et al., 1993), is a food culture classically isolated in Sourdough (Katina, 2009). *Weissella* genus is part of the family *Leuconostocaceae* among *Convivina*, *Fructobacillus*, *Leuconostoc*, *Oenococcus* and close relatives to *Lactobacillaceae* (Zheng et al., 2020). The species was separated recently between *W. confusa* and *W. cibaria* (Björkroth et al., 2002). *W. confusa* and *W. cibaria* are close related species. During the confirmation of identification of the isolates, three phenotypically identified as *W. confusa* were confirmed by genetic identification as *W. cibaria*. The species has also gained interest recently for the potential probiotic properties of different isolates (Falck et al., 2016; Lee et al., 2012; Reis et al., 2016). On the other side, it has also gained interest by clinical microbiologists while being reported for its presence in human samples as causative agent of infection (See Sections 2.5 and 3.2).

Balancing the positive and negative aspects of the species, it is questionable whether or not it can be used safely in the food chain (Sturino, 2018; Abriouel et al., 2015; Sturino, 2018). We have therefore done the safety demonstration of the microbial species *W. confusa*, using the two proposed rationales of demonstration based on a species – food matrix approach, IDF / EFFCA (Bourdichon et al., 2012), and the rationale proposed by EFSA BIOHAZARD Panel for a strain voluntarily used in the food chain (Herman et al., 2019). A preliminary safety demonstration has already been conducted for a *W. confusa* strain performing a 90-day sub-chronic oral toxicity (gavage) study using Sprague Dawley rats (Cupi and Elvig-Jørgensen, 2019).

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A collection of isolates of *W. confusa* has been done, considering both isolation in food matrices and clinical specimen. Using the EFSA and IDF – EFFCA approach we considered the taxonomic identification, body of knowledge, safety concerns and end use (EFSA), the history of use, taxonomy, undesirable properties: opportunistic infections, toxic metabolites and virulence factors and antibiotic resistance (IDF – EFFCA). Based on the gathered evidence, it will be possible to define the status of the *W. confusa* species and consider the further use (or not) of *W. confusa* strains in the food chain.

2. Material and methods

2.1. Bacterial strains and culture conditions

A total of 46 *Weissella confusa* strains, including 17 clinical isolates and 26 strains of food origin, were investigated (Tables 1 and 2).

For the clinical isolates, 15 strains were obtained from the Culture Collection University of Gothemburg (CCUG), 1 strain from the Collection de l'Institut Pasteur (CIP) and 1 strain from the BCCM/LMG Bacteria Collection.

The food isolates were provided by different members of the European Food and Feed Cultures Association (EFFCA). Isolates were routinely grown anaerobically (Anaerocult®, Merck, Germany and Anaerobic Jar, Oxoid, United Kingdom) at 30 °C in MRS agar (BD Difco, Sparks, MD, USA). 3 isolates were identified as *W. cibaria* and not further used in the present study.

2.2. Antibiotic susceptibility testing and MIC determination

The antibiotic susceptibility of *W. confusa* strains was determined by broth microdilution according to the ISO 10932/IDF 233 method (Huys et al., 2010; ISO, 2010). VetMIC Lact-1 and Lact-2 plates (SVA National Veterinary Institute, Uppsala, Sweden) were used according to the manufacturer's instructions except for Daptomycin (Merck KGaA, Darmstadt, Germany). A bacterial suspension was made by picking colonies from MRS plates and adding these to sterile saline solution to reach a density corresponding to a McFarland value of 1. The suspension was diluted 1:1,000 in LAB susceptibility test medium (LSM) and 100 μL of this dilution was added to each well of the VetMIC plate. For Daptomycin, a stock solution of the antibiotic was firstly prepared in methanol, then double strength serial dilutions of the antibiotic were prepared in distilled water and 50 μL dispensed into the wells of the microdilution plates. Bacterial inoculum was diluted 500-fold using 2× LSM and then added to the serial 2-fold dilution Daptomycin at the same volume. *Lactobacillus plantarum* ATCC 14917 was used as quality control strain. The plates were incubated in anaerobiosis at 30 °C for 48 h before reading the optical density at 620 nm. The MIC was determined in duplicate.

2.3. Haemolytic activity

The haemolytic activity of *W. confusa* isolates was tested by streaking bacterial cultures on Columbia agar plates (Oxoid, Altrincham, England) containing 5% (*w/v*) defibrinated sheep blood (Biolife, Milano, Italy) and anaerobically incubated at 30 °C for 48 h. A preliminary screening was conducted to make sure that the test medium supported considerable growth of all organisms under investigation. *Staphylococcus aureus* ATCC 6538 was used as a positive control. The presence of α- or β-haemolysis is indicated by the formation of greenish or clear zones around the colonies, respectively.

2.4. Whole genome sequencing of the 43 isolated strains

Genomic DNA of the 43 isolated strains were extracted by using MasterPure™ Gram Positive DNA Purification Kit (Lucigen Corporation, Middleton, WI, USA), according to the provided protocol. The quality of the extracted DNA was then checked by means of agarose gel electrophoresis (0.8%) and the quantity was determined using Qubit fluorometer (Life Technologies, Carlsbad, CA, USA).

Whole-genome sequencing was then performed with the Illumina NextSeq platform, using the NextSeq High kit (Illumina Inc., San Diego, CA) for library preparation (2 × 150 bp). Quality filtering and adaptors removal were carried out using Trimmomatic software (v0.32) (Bolger et al., 2014). De novo genome assemblies were obtained with the Shovill pipeline version 1.0.9 (https://github.com/tseemann/shovill) and assembled with SPAdes v3.13.1 (Bankevich et al., 2012) using k-mer size 31, 51, 71, 91 and 111, under default parameters. The quality of the assembled genomes was evaluated with QUAST (v4.6.0) (Gurevich et al., 2013). Assemblies annotation was then performed by Prokka (1.13.3) (Seeman, 2014). The presence of antibiotic resistance genes in the genomic sequences was also evaluated using the Resistance Gene Identifier (RGI) database (Jia et al., 2017). Integrated prophages and bacteriocins were investigated using PHASTER and BAGEL4, respectively (de Jong et al., 2006; Arndt et al., 2016). The presence of

Table 1
General genomic features of the clinical isolated *Weissella confusa* genomes ($n = 17$).

Collection strain	Source	Accession NCBI	Genome size (Mb)	GC content (%)	No of scaffolds	N50 (bp)	No of CDSs	Coding density (%)
CCUG 17582	Human bone marrow transfer, 6-month-old boy	JAAOCZ000000000	2.33	44.56	59	93,766	2249	87.6
CCUG 30763	Dog autopsy	JAAOCY000000000	2.29	44.77	17	566,279	2126	88.6
CCUG 30943	Human gall, T-drain, 11 years old girl	JAAOCX000000000	2.33	44.68	41	148,492	2176	88.0
CCUG 30969	Human drain, 13 years old girl	JAAOCW000000000	2.31	44.76	36	186,847	2157	88.3
CCUG 36556	Human blood, one-year old boy	JAAOCV000000000	2.18	44.78	23	288,100	2083	89.0
CCUG 37938	Human faeces, healthy 41 years old man	JAAOCU000000000	2.24	44.78	43	171,492	2124	88.4
CCUG 39150	Human faeces, 77 years old man	JAAOCT000000000	2.25	44.84	31	165,344	2061	88.4
CCUG 39518	Human faeces, 26 years old healthy man	JAAOCS000000000	2.27	44.67	35	156,974	2203	88.5
CCUG 39957	Human blood, lymphoma, abdomen, 65 years old man	JAAOCR000000000	2.27	44.64	32	272,851	2202	88.5
CCUG 41966	Human faeces, dialysis patient	JAAOCQ000000000	2.28	44.80	31	197,133	2116	89.0
CCUG 43002	Human	JAAOCP000000000	2.41	44.57	41	186,846	2256	88.0
CCUG 51220	Human blood, 62 years old man	JAAOCO000000000	2.23	44.72	38	159,216	2140	88.3
CCUG 54486	Human drain, 51 years old man	JAAOCN000000000	2.22	44.76	41	156,201	2124	88.3
CCUG 58143	Human gall, 55 years old woman	JAAOCM000000000	2.20	44.74	31	205,933	2096	88.2
CCUG 61560	Human ascitic fluid, 47 years old man	JAAOCL000000000	2.26	44.70	36	106,689	2154	88.1
CIP 102578	Human foot pus	JAAOCK000000000	2.26	44.74	41	142,452	2182	88.5
LMG 14040	Dog, ear otitis	JAAOCJ000000000	2.16	44.99	23	244,838	1955	88.9

Table 2
General genomic features of the food isolated *Weissella confusa* genomes ($n = 26 + 3$ in the NCBI database).

Collection strain	Source	Accession NCBI	Genome size (Mb)	GC content (%)	No of scaffolds	N50 (bp)	No of CDSs	Coding density (%)
DSM 20196^T	Sugar Cane	JAAOED000000000	2.30	44.82	47	109,612	2169	88.3
DSM 20194	Soured Carrot Mash	JAAOEC000000000	2.21	44.73	31	161,796	2082	88.7
LMG 11983	Grass silage	JAAOEB000000000	2.37	44.68	105	58,576	2209	86.9
LMG 17695	Chili bo	JAAOEA000000000	2.23	44.81	24	313,611	2118	88.8
LMG 17696	Chili bo	JAAODZ000000000	2.24	44.92	36	121,581	2044	87.9
LMG 17698	Chili bo	JAAODY000000000	2.27	44.81	35	121,581	2076	87.7
LMG 17705	Chili bo	JAAODX000000000	2.17	44.89	24	313,611	2026	88.9
LMG 18475	Tapai	JAAODW000000000	2.14	44.79	58	71,641	2044	88.3
LMG 18476	Tapai	JAAODV000000000	2.33	44.59	34	200,639	2241	88.8
LMG 18477	Tempeh	JAAODU000000000	2.33	44.58	34	197,530	2240	88.4
LMG 18478	Tapai	JAAODT000000000	2.33	44.59	34	197,530	2241	88.8
LMG 27187	Sourdough	JAAODS000000000	2.32	44.59	73	103,755	2228	87.5
UC 010F3	Sorghum sourdough	JAAODN000000000	2.36	44.65	16	631,641	2204	89.0
UC 024F6	Sorghum sourdough	JAAODM000000000	2.30	44.57	42	149,083	2210	87.8
UC 048F3	Sorghum sourdough	JAAODL000000000	2.29	44.60	36	149,083	2199	87.8
UC 710F16	Sorghum sourdough	JAAODK000000000	2.28	44.68	22	262,315	2202	89.0
UC 724F13	Sorghum sourdough	JAAODJ000000000	2.33	44.71	17	631,603	2164	87.4
UC 748F4	Sorghum sourdough	JAAODI000000000	2.27	44.75	31	193,332	2094	88.1
BCC 2330	Sourdough	JAAODH000000000	2.09	44.90	103	35,158	2007	87.6
BCC 2344	Sourdough	JAAODG000000000	2.16	45.06	70	56,829	2046	87.5
BCC 2384	Sourdough	JAAODF000000000	2.09	44.97	81	50,964	2001	88.0
BCC 3038	Sourdough	JAAODE000000000	2.31	44.66	47	139,916	2253	87.9
BCC 3262	Sourdough	JAAODD000000000	2.14	44.90	91	48,997	2063	87.9
BCC 4194	Sourdough	JAAODC000000000	2.16	44.98	72	56,266	2051	88.4
BCC 4230	Sourdough	JAAODB000000000	2.24	44.84	45	106,750	2175	88.4
BCC 4255	Sourdough	JAAODA000000000	2.08	44.99	81	53,022	1980	87.5
VTT E-90392	–	ASM477129v1	2.37	44.85	4	2,355,805	2211	87.8
VTT E-133279	–	ASM477107v1	2.22	45.08	2	2,212,145	2012	88.3
N17	–	ASM1104433v1	2.26	44.70	4	2,279,677	2037	90.3

Clustered Regularly Interspaced Short Palindromic Repeats (CRISPRs) was evaluated with CRISPRCasFinder (Couvin et al., 2018). The presence of plasmids was investigated with PlasmidFinder 2.1 (Carattoli et al., 2014).

Pan-genome analysis was carried out with ROARY (3.12.0) (Page et al., 2015) as previously described (Fontana et al., 2018), using default parameters, on the 43 isolates collected and sequenced, along with 3 publicly available complete genomes of *W. confusa* (VTT E-90392, VTT E-133279, N17) from the NCBI database (Access: April 10, 2020), for a total of 46 genome sequences. The core gene alignment resulted from ROARY was then used in RAxML (8.2.12) to build a maximum-likelihood phylogenetic tree. The effect of the isolation source on the genomic content of the strains was evaluated in Past3 (3.26) (Hammer et al., 2001) using a Principal Coordinates Analysis (PCoA) based on the Euclidean distance of the gene presence–absence matrix generated from ROARY (Fig. 3).

The whole genome sequencing project for *W. confusa* strains has been deposited at DDBJ/ENA/GenBank under the project number PRJNA609074 and the accession numbers JAAOCJ000000000-JAAOED000000000.

2.5. Bibliographical survey: Opportunistic infection case reports

The review is based on literature database web search using the same keywords used by EFSA Biohazard Panel: "*Lactobacillus confusus*" OR "*Weissella confusa*" AND "infection*" OR "abscess*" OR "sepsis*" or "septic*" OR "bacteremia" OR "bacteraemia" OR "toxin*" for surveillance of sepsis, "endocarditis" OR "abscess" OR "meningitis" for surveillance of identified disease. The references used in the article were further searched for other case reports, as some of the cases are not available directly through PUBMED or not using the present list of keywords. Additional search was performed on Google Scholar to search for non-PUBMED references. Doing this "multi-layered" web search allows us to gather more cases than reported in the previous review published on *W. confusa* case reports. (see Section 3.2 and Table 3).

3. Results

3.1. History of use

W. confusa is referenced in the IDF / EFFCA Inventory of Microbial Food Cultures (Bourdichon et al., 2018), based on the published safety demonstration rationale (Bourdichon et al., 2012). The species is commonly found in foods and has been isolated in various indigenous fermented foods around the globe: Sourdough in China (Liu et al., 2016), African cereal foods (Oguntoyinbo et al., 2011), vegetables juices in Asia (Xu et al., 2018), yet it presently lacks commercial applications (Fessard and Remize, 2017). It has been considered for its potential rationalized usage in the food chain (Fusco et al., 2015). A recent Italian publication (Quattrini et al., 2020) propose a phenotypic characterization of both *W. confusa* and *W. cibaria* species, to build the body of knowledge as required in the QPS Approach of EFSA BIOHAZARD Panel (Herman et al., 2019). The authors concluded based on newly available evidence that both species *W. cibaria* and *W. confusa* may be suitable microbial food cultures to be exploited in the food sector and in probiotic formulations.

3.2. Opportunistic infections

The survey and literature search helped to find 19 reports of 50 infections caused by *W. confusa* isolates. The distribution over the last 30 years show a law prevalence of infection: 21 reported cases in 1990 and 1991, 9 reported cases from 2001 to 2007, 20 reported cases from 2011 to 2020. Considering the low ability of growth of *W. confusa* and competition with background flora on blood agar, which is classically used for microbial investigation of blood cultures, it is considered by many authors of the case report that the real prevalence is potentially underestimated. The results are presented in Table 3.

Immunodeficiency was identified for 24 cases (50%). Vancomycin as first line of antibiotic prophylaxis is also reported for 27 cases (54%).

Associated comorbidities and use of an antibiotic which *W. confusa* species is naturally resistant to lead us to conclude that infection might not be caused by pathogenic properties per se of a food culture which is

Table 3
Opportunistic infection case reports for *Weissella confusa* isolates (18 reports, $n = 49$).

Infection	Sex	Age	Immunostatus	Risk Factors (comorbidities)	Antibiotherapy: 1st Line	Antibiotherapy: 2nd Line	Outcome	Reference
Organ colonization	–	–	–	–	Vancomycin	Penicillin, Ampicillin	Cured	Green et al., 1990
Organ colonization	–	–	–	–	Vancomycin	Penicillin, Ampicillin	Cured	Green et al., 1990
Organ colonization	–	–	–	–	Vancomycin	Penicillin, Ampicillin	Cured	Green et al., 1990
Organ colonization	–	–	–	–	Vancomycin	Penicillin, Ampicillin	Cured	Green et al., 1990
Bacteraemia	–	–	–	–	Vancomycin	Penicillin, Ampicillin	Cured	Green et al., 1990
Organ colonization	–	–	Compromised	Liver Transplant Recipient	Vancomycin	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Organ colonization	–	–	Compromised	Liver Transplant Recipient	Vancomycin	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Organ colonization	–	–	Compromised	Liver Transplant Recipient	Vancomycin	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Organ colonization	–	–	Compromised	Liver Transplant Recipient	Vancomycin	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Organ colonization	–	–	Compromised	Liver Transplant Recipient	Vancomycin	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Organ colonization	–	–	Compromised	Liver Transplant Recipient	Vancomycin	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Organ colonization	–	–	Compromised	Liver Transplant Recipient	Vancomycin	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Organ colonization	–	–	Compromised	Liver Transplant Recipient	Vancomycin	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Organ colonization	–	–	Compromised	Liver Transplant Recipient	Vancomycin	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Organ colonization	–	–	Compromised	Liver Transplant Recipient	Vancomycin	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Organ colonization	–	–	Compromised	Liver Transplant Recipient	Vancomycin	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Organ colonization	–	–	Compromised	Liver Transplant Recipient	Vancomycin	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Organ colonization	–	–	Compromised	Liver Transplant Recipient	Vancomycin	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Bacteraemia	Male	71y	–	–	–	–	Cured	Riebel and Washington, 1990
Bacteraemia	Female	12y	–	–	–	–	Cured	Riebel and Washington, 1990
Abscess	Male	49y	–	–	–	–	Cured	Bantar et al., 1991
Bacteraemia	Male	46y	–	–	–	–	Cured	Olano et al., 2001
Endocarditis	Male	49y	–	–	–	–	Death	Flaherty et al., 2003
Bacteraemia	–	–	–	–	–	–	–	(Sullivan and Nord, 2006)
Bacteraemia	–	–	–	–	–	–	–	Kulwichit et al., 2007
Bacteraemia	–	–	–	–	–	–	–	Kulwichit et al., 2007
Not specified	–	–	–	–	–	–	–	Kulwichit et al., 2007
Not specified	–	–	–	–	–	–	–	Kulwichit et al., 2007
Endocarditis	Male	65y	Competent	Central Venous Catheter	Penicillin and Gentamicin	Gentamincin	Cured	Shin et al., 2007
Bacteraemia	Male	4y	–	–	–	–	Cured	Svec et al., 2007
Bacteraemia	Male	54y	Compromised	Organ Transplant	Ceftriaxone	Metronidazole	Cured	Harlan et al., 2011
Bacteraemia	Female	58y	Compromised	Immunodeficiency	Vancomycin, ceftazidime	–	Death	Lee et al., 2011
Bacteraemia	Male	68y	Competent	Metabolism disorder	Ampicillin	–	Death	Lee et al., 2011
Bacteraemia	Female	62y	Compromised	Immunodeficiency	Vancomycin, ceftazidime	–	Death	Lee et al., 2011
Bacteraemia	Female	92y	Competent	Metabolism disorder	Ampicillin	–	Death	Lee et al., 2011
Bacteraemia	Female	27y	Compromised	Immunodeficiency	Amoxicillin	–	Cured	Lee et al., 2011
Bacteraemia	Female	62y	Competent	Metabolism disorder	None	–	Death	Lee et al., 2011
Bacteraemia	Male	73y	Compromised	Immunodeficiency	Cefepime	–	Death	Lee et al., 2011
Bacteraemia	Male	52y	Compromised	Immunodeficiency	Amoxicillin	–	Cured	Lee et al., 2011
Bacteraemia	Female	8y	Competent	Metabolism disorder	Vancomycin, ceftazidime	–	Cured	Lee et al., 2011
Bacteraemia	Male	64y	Competent	Invasive procedure	Amoxicillin	–	Cured	Lee et al., 2011
Bacteraemia	Male	34y	Compromised	Immunodeficiency	Vancomycin, aztreonam	Daptomycin	Cured	Salimnia et al., 2011
Bacteraemia	Male	58y	Competent	Invasive procedure	Vancomycin, imipenem	Daptomycin	Cured	Salimnia et al., 2011
Bacteraemia	Male	48y	Compromised	Total parenteral nutrition	Cefoperazone–sulbactam, metronidazole	–	Cured	Kumar et al., 2011

(continued on next page)

Table 3 (*continued*)

Infection	Sex	Age	Immunostatus	Risk Factors (comorbidities)	Antibiotherapy: 1st Line	Antibiotherapy: 2nd Line	Outcome	Reference
Bacteraemia	Female	60y	Competent	–	Ceftriaxone	Teicoplanin, Piperacillin-Tazobactam	Cured	Wonmok Lee et al., 2013
Abscess	Female	94y	Competent	Invasive procedure	Levofloxacin	–	Not cured	Medford et al., 2014
Bacteraemia	Female	63y	Compromised	Crohn's disease	Vancomycin	Daptomycin, Piperacillin-Tazobactam	Cured	Vasquez et al., 2015
Bacteraemia	Male	14y	Compromised	Blastoma chemiotherapy	Vancomycin, cocktail	Clindamycine, Amikacyne	Cured	Aberkane et al., 2017
Meningitis	Male	78y	Compromised	Immunodeficiency	Vancomycin, cocktail	Ampicillin	Cured	Cheaito et al., 2020
Bacteraemia	Male	25y	Competent	Metabolism disorder	Vancomycin, Meropenem	Cefuroxime	Cured	Spiegelhauer et al., 2020

highly prevalent in the food diet (sourdough, vegetables, …), but rather to underlying conditions of the host and gut dysbiosis which leads to translocation of the gut flora in the bloodstream.

3.3. Antibiotic resistance profiles

Tables 4 and 5 show the MIC ranges of all tested antibiotics for *W. confusa* strains isolated from clinical and food samples, respectively. All strains displayed MIC values higher than 1024 μg mL-1 for Vancomycin and Trimethoprim. For each antibiotic, the highest MIC that defines the upper end of the wild-type MIC distribution (Kahlmeter et al., 2003) was as follows: Gentamicin 4, Kanamycin 64, Streptomycin 64, Neomycin 8, Ampicillin 1, Penicillin 2, Quinupristin-dalfopristin 2, Tetracycline 8, Erythromycin 0.5, Clindamycin 2, Chloramphenicol 8, Linezolid 4, Ciprofloxacin 8, Rifampicin 16, Daptomycin 1 μg mL-1. Notably, Clindamycin resulted the only antibiotic among those analysed for which the MIC distribution among foodborne strains covered more than the optimal five dilutions surrounding the modal MIC predicted for wild-type organisms (Arendrup et al., 2009; Kahlmeter and Brown, 2004; Turnidge et al., 2006; Turnidge and Paterson, 2007).

For those antibiotics proposed by EFSA for assessment of bacterial antimicrobial susceptibility, the MIC values of all *W. confusa* strains were equal to or lower than the established EFSA cut-off values of *Lactobacillus* obligate heterofermentative species with the exception of Kanamycin and Chloramphenicol. As far as Kanamycin is concerned, 9 out of 17 clinical isolates and 12 out of 26 food isolates had a MIC of 64 μg mL-1 (EFSA breakpoint = 32 μg mL-1) while for Chloramphenicol 16 clinical and 9 food isolates had a MIC of 8 μg mL-1 (EFSA breakpoint = 4 μg mL-1). Moreover, among the clinical isolates, *W. confusa* CCUG 39150 displayed a MIC of 8 as compared with an EFSA breakpoint of 2 for Ampicillin.

3.4. Haemolytic activity

We did not observe any production of clear or greenish zones on the blood agar around bacterial colonies, indicating that all strains among tested *W. confusa* isolates were non-haemolytic.

3.5. General genomic features

The average genome size and GC content of *W. confusa* isolates were 2.3 Mb and 44.8%, respectively (Tables 1 and 2). Gene finding and annotation resulted in an average of 2133 coding sequences (CDSs), with a coding density of 88.3%. Plasmids were absent in all genomes. Mobile genetic elements such as prophages, integrases, and insertion sequences (ISs) were evidenced. Specifically, thirty-four isolates (14 clinical out of 17 strains and 20 food out of 29 strains) presented one or more complete prophage regions in their genomes (Supplementary File - Datasheet A). Numerous site-specific integrases were found in all strains (except for LMG 14040 and LMG 11983) counting on average 4 genes in each genome for both clinical and food isolates. Moreover, ISs belonging to different transposase families (IS3, IS4, IS30, IS110, IS1380, ISL3) counted on average 5 and 7 genes per genome for clinical and food isolates, respectively (Supplementary File - Datasheet B). Regarding the CRISPR-Cas system, 1 CRISPR (evidence level = 4) was found in BCC2384 and LMG11983 isolated from sourdough and grass silage, respectively (Supplementary File - Datasheet C). The strain LMG11983 also showed 4 CRISPR-associated genes (Cas), Cas1, Cas2 and two copies of Csn2.

3.6. Comparative genomics analyses

Comparative genomic analysis identified a *W. confusa* pangenome of

Table 4
Distribution of MICs of tested antibiotics for *Weissella confusa* isolates ($n = 17$) from clinical samples.

	Isolates with the following MICs (μg mL^{-1})																
Antibiotics	0.03	0.06	0.12	0.25	0.5	1	2	4	8	16	32	64	128	256	512	1024	>1024
Gentamicin						3	9	5									
Kanamycin											8	9					
Streptomycin										9	8						
Neomycin						4	10	3									
Ampicillin					8	8			1								
Penicillin				7	9		1										
Vancomycin																	17
Quinupristin-dalfopristin						10	7										
Tetracycline							1	12	4								
Erythromycin		1	5	10	1												
Clindamycin		3	5	6	3												
Chloramphenicol								1	16								
Linezolid							9	8									
Trimethoprim																	17
Ciprofloxacin							13	4									
Rifampicin									10	7							
Daptomycin			1	3	12	1											

Table 5
Distribution of MICs of tested antibiotics for *Weissella confusa* isolates (n = 26) from food samples.

	Isolates with the following MICs (μg mL^{-1})																
Antibiotics	**0.03**	**0.06**	**0.12**	**0.25**	**0.5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**	**>1024**
Gentamicin					2	6	9	9									
Kanamycin									1	1	12	12					
Streptomycin								1	2	7	13	3					
Neomycin						9	8	7	2								
Ampicillin				6	15	5											
Penicillin			3	14	8	1											
Vancomycin																	30
Quinupristin-dalfopristin		1		3	6	14	2										
Tetracycline	1						15	10									
Erythromycin		2	11	11	2												
Clindamycin	3	6	1	6	8	2											
Chloramphenicol						1		16	9								
Linezolid						2	19	5									
Trimethoprim																	30
Ciprofloxacin						1	21	4									
Rifampicin						2		6	11	7							
Daptomycin		2	3	3	15	3											

6886 genes, including 1161 "Core" genes (shared between the 99% and 100% of the strains), 123 "Soft-core" genes (between 95% and 98%), 1398 "Shell" genes (between 15% and 94%), and 4204 "Cloud" genes (less than 15% of the strains) (Fig. 1A). It was evidenced that the *W. confusa* pangenome can be considered as "open" since an average of 50 new genes are continuously added for each additional genome considered (Fig. 1B). This indicates also the presence of unique genes in each genome. The Roary matrix built on the presence-absence of core and accessory genes (Fig. 1B) highlighted 16 clusters associated with the clinical isolates of *W. confusa* (Supplementary File -Datasheet D). Specifically, four among these clusters (Cluster 1, Cluster 7, Cluster 8, Cluster 15) showed the presence of a transcriptional regulator belonging to the phage-encoded autolysin regulatory protein (ArpU) family. Phage holins were found in 10 clusters (Supplementary File - Datasheet D), whereas multiple copies of lysin gene were evidenced in Cluster 7, Cluster 9, and Cluster 16, and in single copy in Cluster 5 and Cluster 12. Many gene copies of xenobiotic response element (XRE) transcriptional regulators (9) were also found among these clusters (Supplementary File - Datasheet D). The XRE family of transcriptional regulators are represented by a large family of proteins with a helix-turn-helix DNA-binding motif like the CI repressor and the Cro proteins of λ bacteriophage (Ptashne et al., 1976; Roberts et al., 1977; Sauer et al., 1982). IS3 family transposase genes were found: ISWci2 in Cluster 3, Cluster 4, and Cluster 14; IS1163 in Cluster 10. as well as site-specific integrases were also present (Cluster 12, Cluster 13 and Cluster 16). Glycosyltransferase and sugar transferase coding genes were also highly represented within these clusters (Supplementary File - Datasheet D), among which transferases genes related to the exopolysaccharides biosynthesis (*epsD*, *epsF*, *epsM*). Genes of transporters proteins were also considerably represented, including: MATE family efflux transporter, ABC transporter substrate-binding protein, sulfate exporter family transporter, MFS transporter, DHA2 family efflux MFS transporter permease, methionine ABC transporter substrate-binding protein and O-antigen transporters. A mucus-binding protein was identified in Cluster 11, belonging to CCUG 54486 strain isolated from human drain. Metalloenzymes were found: manganese catalase (Cluster 7) and zinc-binding alcohol dehydrogenase (Cluster 1), glyoxalase (Cluster 3), iron-sulfur cluster carrier protein (Cluster 14), *immA/irrE* family metallo-endopeptidases genes (Cluster 12). A capsular protein coding gene (*cap8A*) was evidenced in Cluster 1, Cluster 3, Cluster 12, Cluster 15. Six clusters presented the tyrosine-protein kinase YwqD, and two among these clusters also contained the gene of tyrosine-protein phosphatase *ywqE* (Supplementary File - Datasheet D). Two clusters evidenced genes coding for two toxin-related proteins: genes of the endoribonuclease toxin *mazF* and the antitoxin *mocA*, belonging to Cluster 4 (CCUG 43002 strain) and Cluster 13 (CCUG 51220 strain isolated from human blood), respectively. Cluster 4 also

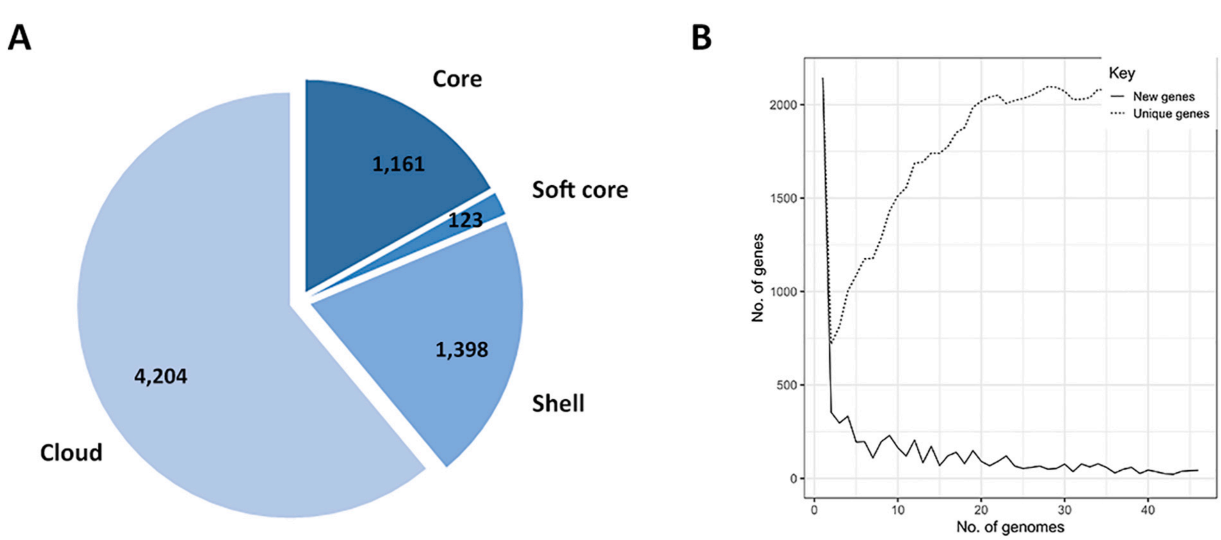

Fig. 1. Comparative genomics analysis of the 46 *Weisella confusa* strains. Pangenome content (A). Unique genes and new genes content variation as new genomes are added to the analysis (B).

presented an enzyme responsible for glycerol metabolism: 1,3-propanediol dehydrogenase (DhaT), whereas Cluster 16 (specific to CIP 102578 strain isolated from human foot pus) contained the lactate dehydrogenase enzyme (Supplementary File - Datasheet D).

From the phylogenetic tree built on the core gene alignment of ROARY, it is evidenced the distribution of clinical isolates among the food strains (Fig. 1B). Interestingly, a group of food isolates clustered apart from the others. These strains included all BCC isolates from sourdough, the LMG 11983 strain from grass silage, the type strain DSM 20196 from sugar cane and VTT_E_90,392 isolated from carrot. Considering instead the PCoA on the gene presence–absence matrix from ROARY, it was evaluated the effect of the isolation source on the genomic content of the strains. Only plant and grass isolates were significantly separated from the other strains (Fig. 2).

3.7. Functional categories related to safety

3.7.1. Antibiotic resistance genes

The search against the RGI database did not evidence specific genes related to antibiotic resistance. From the annotation with Prokka, it was showed the presence of genes coding for one multidrug resistance protein SMR and one teicoplanin resistance protein VanZ in all isolates, with an additional copy of *vanZ* gene in four BCC strains (food isolates). A bicyclomycin resistance protein was also highlighted in all the strains considered, as well as multiple copies of *tetR/acrR* family transcriptional regulator gene. The gene encoding a bifunctional polymyxin resistance protein (*arnA*) was present in the clinical isolate LMG14040 (Supplementary File - Datasheet E).

3.7.2. Bacteriocins

Genome mining with BAGEL4 database and Prokka annotation did not evidence the presence of bacteriocins.

3.7.3. Virulence factors

Two genes copies of *yihY*/virulence factor BrkB family protein were found in all strains, whereas 1 gene coding for the surface virulence-associated protein B was present in 42 isolates. Haemolysin III coding gene was shown in all the investigated genomes (Supplementary File - Datasheet E).

3.7.4. Decarboxylases and biogenic amines formation

Genes coding for decarboxylase enzymes responsible for biogenic amines production, such as histidine decarboxylase (HDC), tyrosine decarboxylase (TDC), lysine decarboxylase (LDC), ornithine decarboxylase (ODC), agmatine deiminase (AgDI) were absent in all genomes under investigation. An incomplete arginine deiminase (ADI) pathway, which is responsible for putrescine production in combination with ODC enzyme, was found in all strains, containing a copy of the arginine deiminase coding gene (*arcA*) and ornithine carbamoyltransferase (*arcB*). All genomes except for DSM20196, LMG11983, and VTT E-90392, include also the gene coding for the carbamate kinase enzyme (*arcC*), whereas all strains lack the dedicated arginine/ornithine antiporter gene (*arcD*) (Supplementary File - Datasheet E).

4. Discussion

Microbial risk assessment, as proposed by the Codex Alimentarius (Codex Alimentarius, 1999) is based upon hazard identification (pathogenic properties and ecology in food), both exposure assessment (probability of ingestion) and hazard characterization (mechanism of action), to conclude with the risk characterization (nature and likelihood of the health risk). This approach, while perfectly fit for pathogenic microorganisms, does not apply to food cultures. Neither do the historical postulates of Kock or the recently proposed molecular ones (Falkow, 2004).

Two approaches dedicated to microbial food organisms are proposed, on at the species level with associated food matrix, one with microbial strains for introduction in the food chain (Bourdichon et al., 2019). *W. confusa* is already considered in the IDF-EFFCA inventory of microbial food cultures for its role in sourdough fermentation among others. While collecting the food isolates, the species shows to be present in various other food matrices. Because no strain of *W. confusa* have been submitted to EFSA Biohazard panel for its safety evaluation, the species is not listed in the QPS list of species (EFSA BIOHAZ Panel (EFSA Panel on Biological Hazards), 2020).

There is currently none baseline profile provided for the species for the MIC value acceptable for its antibiotic resistance. Due to the former classification of the species among *Lactobacilli* (*Lactobacillus confusus*) and its obligate heterofermentative properties, the reference profile used for comparison was the one provided by EFSA FEEDAP Panel for *Lactobacillus* obligate heterofermentative (FEEDAP Panel, 2018). Based upon our results, this profile can be used for most of the antibiotic apart from Kanamycin and Chloramphenicol. From the annotation of the 46 genomes obtained, no resistance genes could be identified to explain the difference observed for the MIC values (one-fold each time, 64 vs. 32 μg mL-1 and 8 vs. 4 μg mL-1 respectively). Same wise, the higher MIC value of 8 vs. 2 μg mL-1 for Ampicillin for strain CCUG39150 could not be explained from the annotation of its genome, or specific screening for known *AmpR* genes.

The screening for annotated virulence genes or decarboxylase

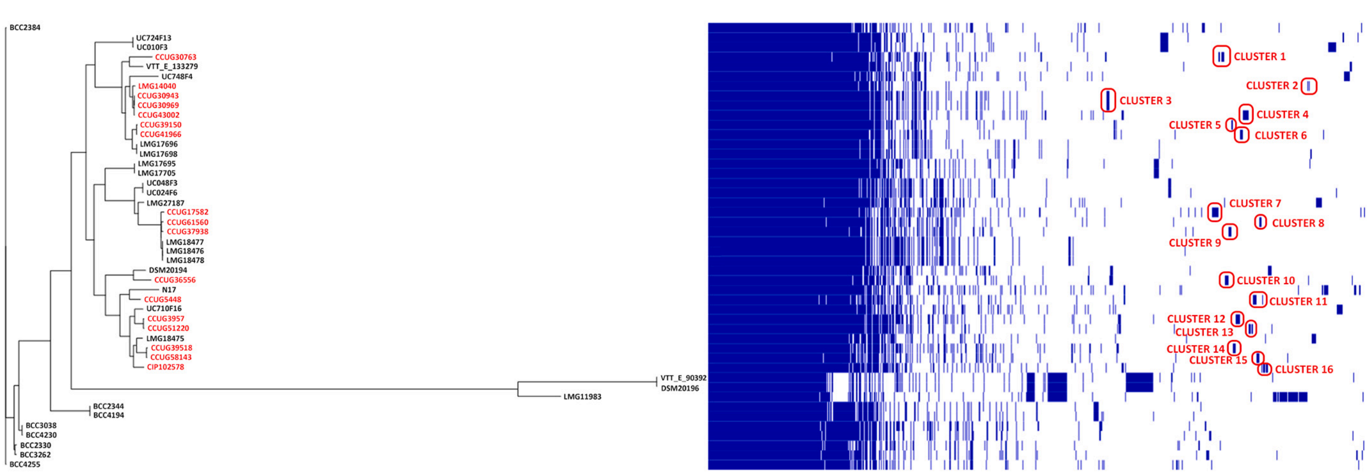

Fig. 2. Phylogenetic tree based on the core gene alignment and gene presence-absence matrix from ROARY. Cluster of genes specific to clinical isolates were highlighted.

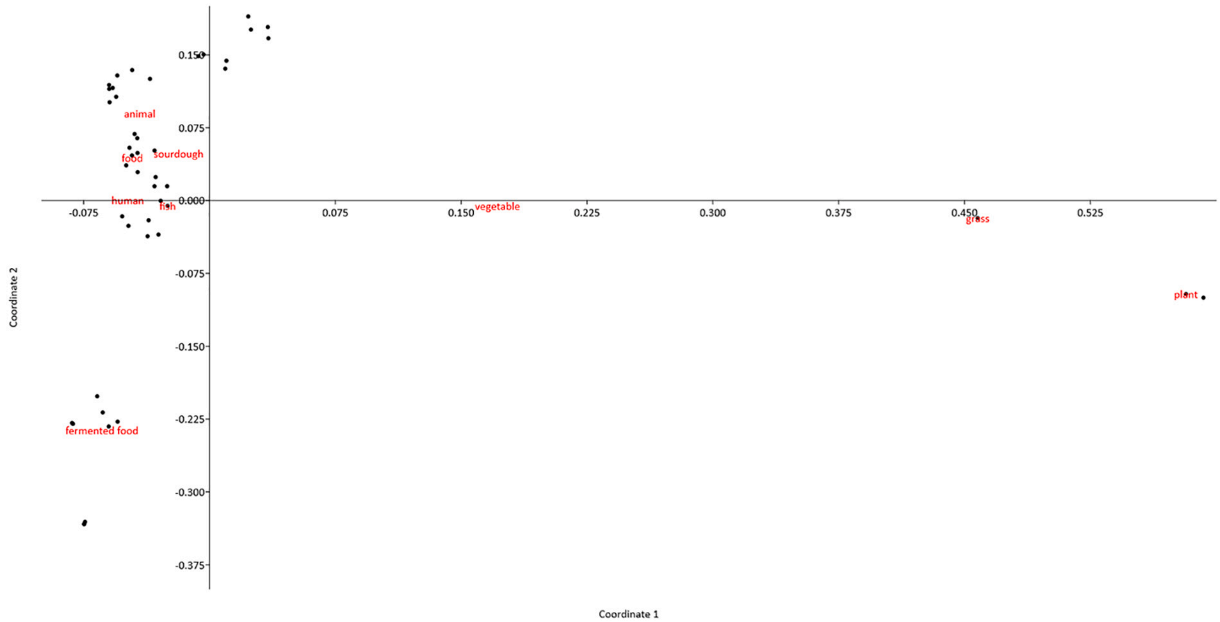

Fig. 3. PCoA on the gene presence–absence matrix from ROARY, considering the effect of the isolation source on the genomic content of the strains.

potential activity did not show any concern for the 46 genomes. Despite previous findings of bacteriocin-producing strains belonging to *W. confusa* and its close neighbour species *W. cibaria* (Chavasirikunton et al., 2007; Heng et al., 2017; Li et al., 2017; Srionnual et al., 2007), none of the strains investigated in this study is expected to produce bacteriocin genes or any toxin. It has been reported that some LAB bacteriocins can be plasmid-associated, as for the *W. confusa* strain MBF8–1 (Malik et al., 2016). Thus, the lack of bacteriocin-related genes in all the 46 strains evaluated could be also possibly due to the loss of plasmid sequences.

Regarding the potential usage of *W. confusa* as a bioprotective culture, apart from ecological competition, the species does not seem to be the best fit-for-purpose candidate. The species is also not expected to be producing biogenic amines compounds such as histamine and tyramine, the two most prevalent deleterious metabolites produced during the fermentation process or shelf life of the food product.

While the history of use and the isolation of the species in various food matrices plays in favour for the safety of the species, the raising concern of isolation of *W. confusa* from human tissues needed further investigation.

The whole genome comparison of the 17 "clinical" isolates vs. the 26 "food" isolates and the three additional available sequences did not reveal any clusters of the clinical vs. the food isolates, nor inserted sequences revealed by G + C proportion. Interestingly, the species harbours a very small core-genome vs. a quite large pan-genome, highlighting expected differences in their metabolic activities and therefore strain specific application either for food process and/or probiotic candidates. This confirms the recent characterization of the species for potential food usages (Quattrini et al., 2020). Of note, two clinical isolates CCUG30943 and CCUG30969 happens to be the same strain. This was already suspected by the health care practitioners back in 1992: both isolations were done at two years interval on the same young female patient (11y and 13y) from a T-drain of the gall bladder, suggesting presence in the gut microbiota and colonization of the gall bladder (history of medical conditions not provided).

The review of 20 infection case reports of 49 isolates of *W. confusa* over 30 years confirms the very low pathogenicity – if any – of the species. While it is clear that the present clinical microbiological practices (aerobic growth on blood agar) can have an impact on under-reporting the effective prevalence of *W. confusa* in human samples, the recent "increase" of isolation seems to be strongly correlated with high comorbidities factors (Immunodeficiency, Organ transplantation, Invasive procedure, co-infection) and the use of Vancomycin, for which *W. confusa* and generally speaking *Lactobactilli* are naturally resistant. As proposed in previous clinical review of the available reports, the isolation of *W. confusa* in human tissue should be considered as consequence of underlying factors of predisposition of the human host, and not a pathogenicity of a food culture which the generally healthy population is largely exposed to. In case of use of Vancomycin, the consequent gut dysbiosis and possible overgrowth of Lactobacilli, either naturally present or trough ingestion should not be underestimated (Pararajasingam and Uwagwu, 2017).

5. Conclusion

The species *W. confusa* shows a very high pan genome and small core genome, therefore harbouring a major genetic diversity between the different strains from the 46 isolates obtained. Nevertheless, no specific features could distinguish "food" from "clinical" isolates, confirming the rare and opportunistic features of the reported infection cases. As suggested in previous articles of *W. confusa* case reports and confirmed by the phenotypic and genotypic investigation of the present collection, underlying factors of the host and use of vancomycin are the most probable explanations for the rare isolation of *W. confusa* in human samples. Considering the isolation and history of safe use in various food matrices, without any evidence of deleterious related metabolic activities genes and virulence genes, the species *W. confusa* should be regarded as safe for use in the food chain, food cultures for fermentation process or as probiotic strain candidate. We therefore propose the species to be granted the QPS status as defined by the EFSA Biohazard panel, and further submitted strains of the species should be granted the "fast track" risk assessment: taxonomic identification, safety concerns such as antibiotic resistance profile and screen for deleterious metabolites (e.g. biogenic amines).

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ijfoodmicro.2020.109028.

References

Cupi, D., Elvig-Jørgensen, S.G., 2019. Safety assessment of *Weissella confusa* - a direct-fed microbial candidate. Regul. Toxicol. Pharmacol. 107, 104414.

EFSA BIOHAZ Panel (EFSA Panel on Biological Hazards), Koutsoumanis, K., Allende, A., Alvarez-Ordonez, A., Bolton, D., Bover-Cid, S., Chemaly, M., Davies, R., De Cesare, A., Hilbert, F., Lindqvist, R., Nauta, M., Peixe, L., Ru, G., Simmons, M., Skandamis, P., Suffredini, E., Cocconcelli, P.S., Fernandez Escamez, P.S., Maradona, M.P., Querol, A., Suarez, J.E., Sundh, I., Vlak, J., Barizzone, F., Hempen, M., Herman, L., 2020. Statement on the update of the list of QPS-recommended biological agents intentionally added to food or feed as notified to EFSA 12: suitability of taxonomic units notified to EFSA until march 2020. EFSA J. 18 (7), 6174, 42 pp. https://doi.org/10.2903/j.efsa.2020.6174.

Aberkane, S., Didelot, M.N., Carrière, C., Laurens, C., Sanou, S., Godreuil, S., Jean-Pierre, H., 2017. *Weissella confusa* bacteremia: an underestimated opportunistic pathogen. Med. Mal. Infect. 47 (4), 297–299.

Abriouel, H., Lerma, L.L., Casado Muñoz, M.C., Montoro, P., Kabisch, J., Pichner, R., Cho, G.S., Neve, H., Fusco, V., Franz, C.M., Gálvez, A., Benomar, N., 2015. The controversial nature of the *Weissella* genus: technological and functional aspects versus whole genome analysis-based pathogenic potential for their application in food and health. Front. Microbiol. 6 (1197).

Codex Alimentarius, 1999. Principles and guidelines for the conduct of microbiological risk assessment. Available at: http://www.fao.org/docs/eims/upload/215254/CAC_GL30.pdf.

Arendrup, M.C., Kahlmeter, G., Rodriguez-Tudela, J.L., Donnelly, J.P., 2009. Breakpoints for susceptibility testing should not divide wild-type distributions of important target species. Antimicrob. Agents Chemother. 53, 1628–1629.

Arndt, D., Grant, J.R., Marcu, A., Sajed, T., Pon, A., Liang, Y., Wishart, D.S., 2016. PHASTER: a better, faster version of the PHAST phage search tool. Nucleic Acids Res. 44 (W1), W16–W21.

Bankevich, A., Nurk, S., Antipov, D., Gurevich, A.A., Dvorkin, M., Kulikov, A.S., Lesin, V.M., Nikolenko, S.I., Pham, S., Prjibelski, A.D., Pyshkin, A.V., Sirotkin, A.V., Vyahhi, N., Tesler, G., Alekseyev, M.A., Pevzner, P.A., 2012. SPAdes: a new genome assembly algorithm and its applications to single-cell sequencing. J. Comput. Biol. 19 (5), 455–477.

Bantar, C.E., Relloso, S., Castell, F.R., Smayevsky, J., Bianchini, H.M., 1991. Abscess caused by vancomycin-resistant *Lactobacillus confusus*. J. Clin. Microbiol. 29 (9), 2063–2064.

Björkroth, K.J., Schillinger, U., Geisen, R., Weiss, N., Hoste, B., Holzapfel, W.H., Korkeala, H.J., Vandamme, P., 2002. Taxonomic study of *Weissella confusa* and description of *Weissella cibaria* sp. nov., detected in food and clinical samples. Int. J. Syst. Evol. Microbiol. 52 (Pt 1), 141–148.

Bolger, A.M., Lohse, M., Usadel, B., 2014. Trimmomatic: a flexible trimmer for Illumina sequence data. Bioinformatics 30 (15), 2114–2120.

Bourdichon, F., Casaregola, S., Farrokh, C., Frisvad, J.C., Gerds, M.L., Hammes, W.P., Harnett, J., Huys, G., Laulund, S., Ouwehand, A., Powell, I.B., Prajapati, J.B., Seto, Y., Ter Schure, E., Van Boven, A., Vankerckhoven, V., Zgoda, A., Tuijtelaars, S., Hansen, E.B., 2012. Food fermentations: microorganisms with technological beneficial use. Int. J. Food Microbiol. 154 (3), 87–97.

Bourdichon, F., Alper, I., Bibiloni, R., Dubois, A., Laulund, S., Miks, M., Morelli, L., Zuliani, V., Yao, S., 2018. Inventory of Microbial Food Cultures with safety demonstration in fermented food products. Update of the Bulletin of the IDF 455–2012. Bulletin of IDF 495–2018, available at: (Accessed April 2020) https://store.fil-idf.org/product/bulletin-idf-n-495-2018-inventory-microbial-food-cultures-safety-demonstration-fermented-food-products/.

Bourdichon, F., Tenning, P., Laulund, S., 2019. Inventory of microbial species with a rationale: a comparison of FIL-IDF / EFFCA inventory of microbial food cultures and EFSA biohazard qualified presumption of safety. FEMS microbiology letters 366(5) fnz048.

Carattoli, A., Zankari, E., Garcia-Fernandez, A., Voldby Larsen, M., Lund, O., Villa, L., Aarestrup, F.M., Hasman, H., 2014. PlasmidFinder and pMLST: in silico detection and typing of plasmids. Antimicrob. Agents Chemother. 58 (7), 3895–3903.

Chavasirikunton, V., Vatanyoopaisarn, S., Phalakornkule, C., 2007. Bacteriocin-like activity from Weissella confusa and Pediococcus acidilactici isolated from traditional thai fermented sausages. J. Cult. Collect. 5, 64–72.

Cheaito, R.A., Awar, G., Alkozah, M., Cheaito, M.A., El Majzoub, I., 2020. Meningitis due to *Weissella confusa*: a case report and review. Am. J. Emerg. Med. https://doi.org/10.1016/j.ajem.2020.02.004.

Collins, M.D., Samelis, J., Metaxopoulos, J., Wallbanks, S., 1993. Taxonomic studies on some *Leuconostoc-like* organisms from fermented sausages: description of a new genus *Weissella* for the *Leuconostoc paramesenteroides* group of species. J. Appl. Bacteriol. 75, 595–603.

Couvin, D., Bernheim, A., Toffano-Nioche, C., Touchon, M., Michalik, J., Néron, B., Rocha, E.P.C., Vergnaud, G., Gautheret, D., Pourcel, C., 2018. CRISPRCasFinder, an update of CRISRFinder, includes a portable version, enhanced performance and integrates search for Cas proteins. Nucleic Acids Res. 46, W246–W251.

Falck, P., Linares-Pastén, J.A., Adlercreutz, P., Karlsson, E.N., 2016.2. Characterization of a family 43 β-xylosidase from the xylooligosaccharide utilizing putative probiotic *Weissella sp.* strain 92. Glycobiology 26(2):193-202.

Falkow, S., 2004. Molecular Koch's postulates applied to bacterial pathogenicity — a personal recollection 15 years later. Nature Reviews Microbiology 2, 67–72.

FEEDAP Panel, 2018. Guidance on the characterisation of microorganisms used as feed additives or as production organisms. EFSA J. 16 (3), 5206.

Fessard, A., Remize, F., 2017. Why are Weissella spp. not used as commercial starter cultures for food fermentation? Fermentation 3 (38). https://doi.org/10.3390/fermentation3030038.

Flaherty, J.D., Levett, P.N., Dewhirst, F.E., Troe, T.E., Warren, J.R., Johnson, S., 2003. Fatal case of endocarditis due to *Weissella confusa*. J. Clin. Microbiol. 41 (5), 2237–2239.

Fontana, A., Zacconi, C., Morelli, L., 2018. Genetic signatures of dairy *Lactobacillus casei* group. Front. Microbiol. 9, 2611.

Fusco, V., Quero, G.M., Cho, G.S., Kabisch, J., Meske, D., Neve, H., Bockelmann, W., Franz, C.M., 2015. The genus *Weissella*: taxonomy, ecology and biotechnological potential. Front. Microbiol. 6, 155.

Green, M., Wadowsky, R.M., Barbadora, K., 1990. Recovery of vancomycin-resistant gram-positive cocci from children. J. Clin. Microbiol. 28 (3), 484–488.

Green, M., Barbadora, K., Michaels, M., 1991. Recovery of vancomycin-resistant gram-positive cocci from pediatric liver transplant recipients. J. Clin. Microbiol. 29 (11), 2503–2506.

Gurevich, A., Saveliev, V., Vyahhi, N., Tesler, G., 2013. QUAST: quality assessment tool for genome assemblies. Bioinformatics 29 (8), 1072–1075.

Hammer, O., Harper, D.A.T., Ryan, P., 2001. Past: Paleontological Statistics Software Package for Education and Data Analysis. Palaeontol. Electron. vol. 4 (issue 1), 9pp art. 4.

Harlan, N.P., Kempker, R.R., Parekh, S.M., Burd, E.M., Kuhar, D.T., 2011. *Weissella confusa* bacteremia in a liver transplant patient with hepatic artery thrombosis. Transpl. Infect. Dis. 13 (3), 290–293.

Heng, N.C.K., Yeh, C.-W., Malik, A., 2017. Draft genome sequence of *Weissella confusa* MBF8-1, a glucansucrase- and bacteriocin-producing strain isolated from a homemade soy product. Genome announcements 5, e01497–e01516. https://doi.org/10.1128/genomeA.01497-16.

Herman, L., Chemaly, M., Cocconcelli, P. S., Fernandez, P., Klein, G., Peixe, L., Prieto, M., Querol, A., Suarez, J. E., Sundh, I., Vlak, J., Correia, S. (2019). The qualified presumption of safety assessment and its role in EFSA risk evaluations: 15 years past. FEMS microbiology letters, 366(1), fny260.

Huys, G., D'Haene, K., Cnockaert, M., Tosi, L., Danielsen, M., Flórez, A.B., Mättö, J., Axelsson, L., Korhonen, J., Mayrhofer, S., Egervärn, M., Giacomini, M., Vandamme, P., 2010. Intra- and interlaboratory performances of two commercial antimicrobial susceptibility testing methods for bifidobacteria and nonenterococcal lactic acid bacteria. Antimicrob. Agents Chemother. 54 (6), 2567–2574.

Jia, B., Raphenya, A.R., Alcock, B., Waglechner, N., Guo, P., Tsang, K.K., Lago, B.A., Dave, B.M., Pereira, S., Sharma, A.N., Doshi, S., Courtot, M., Lo, R., Williams, L.E., Frye, J.G., Elsayegh, T., Sardar, D., Westman, E.L., Pawlowski, A.C., Johnson, T.A., Brinkman, F.S., Wright, G.D., McArthur, A.G., 2017. CARD 2017: expansion and model-centric curation of the comprehensive antibiotic resistance database. Nucleic Acids Res. 45 (D1), D566–D573.

de Jong, A., van Hijum, S.A., Bijlsma, J.J., Kok, J., Kuipers, O.P., 2006. BAGEL: a web-based bacteriocin genome mining tool. Nucleic Acids Res. 34, W273–W279.

Kahlmeter, G., Brown, D.F.J., 2004. Harmonization of antimicrobial breakpoints inEurope-can it be achieved? Clin. Microbiol. Newsl. 26, 187–192.

Kahlmeter, G., Brown, D.F., Goldstein, F.W., MacGowan, A.P., Mouton, J.W., Osterlund, A., Rodloff, A., Steinbakk, M., Urbaskova, P., Vatopoulos, A., 2003. European harmonization of MIC breakpoints for antimicrobial susceptibility testing of bacteria. J. Antimicrob. Chemother. 52, 142–148.

Katina, K., 2009. In situ production and analysis of *Weissella confusa* dextran in wheat sourdough. Food Microbiol. 26 (7), 734–743.

Kulwichit, W., Nilgate, S., Chatsuwan, T., Krajiw, S., Unhasuta, C., Chongthaleong, A., 2007. Accuracies of *Leuconostoc* phenotypic identification: a comparison of API systems and conventional phenotypic assays. BMC Infect. Dis. 7, 69.

Kumar, A., Augustine, D., Sudhindran, S., Kurian, A.M., Dinesh, K.R., Karim, S., Philip, R., 2011. *Weissella confusa*: a rare cause of vancomycin-resistant gram-positive bacteraemia. J. Med. Microbiol. 60 (Pt 10), 1539–1541.

Lee, M.R., Huang, Y.T., Liao, C.H., Lai, C.C., Lee, P.I., Hsueh, P.R., 2011. Bacteraemia caused by *Weissella confusa* at a university hospital in Taiwan, 1997-2007. Clin. Microbiol. Infect. 17 (8), 1226–1231.

Lee, K.W., Park, J.Y., Jeong, H.R., Heo, H.J., Han, N.S., Kim, J.H., 2012. Probiotic properties of *Weissella* strains isolated from human faeces. Anaerobe 1, 96–102.

Lee, W., Cho, S.M., Kim, M., Ko, Y.G., Yong, D., Lee, K., 2013. *Weissella confusa* bacteremia in an immune-competent patient with underlying intramural hematomas of the aorta. Annals of Laboratory Medicine 33 (6), 459–462.

Li, S.-W., Chen, Y.-S., Lee, Y.-S., Yang, C.-H., Srionnual, S., Wu, H.-C., Chang, C.-H., 2017. Comparative genomic analysis of bacteriocin-producing *Weissella cibaria* 110. Appl. Microbiol. Biotechnol. 101, 1227–1237. https://doi.org/10.1007/s00253-016-8073-8.

Liu, T., Li, Yun, Chen, J., Sadiq, F.A., Zhang, G., Li, Yang, He, G., 2016. Prevalence and diversity of lactic acid bacteria in Chinese traditional sourdough revealed by culture dependent and pyrosequencing approaches. LWT Food Sci. Technol. 68, 91–97. https://doi.org/10.1016/j.lwt.2015.12.025.

Malik, A., Sumayyah, S., Yeh, C.W., Heng, N.C.K., 2016. Identification and sequence analysis of pWcMBF8–1, a bacteriocin-encoding plasmid from the lactic acid bacterium *Weissella confusa*. FEMS Microbiol. Lett. Volume 363 (Issue 8), fnw059 https://doi.org/10.1093/femsle/fnw059.

Medford, R., Patel, S.N., Evans, G.A., 2014. A confusing case - *Weissella confusa* prosthetic joint infection: a case report and review of the literature. Canadian Journal of Infectious Diseases & Medical Microbiology 25 (3), 173–175.

Oguntoyinbo, F.A., Tourlomousis, P., Gasson, M.J., Narbad, A., 2011. Analysis of bacterial communities of traditional fermented west African cereal foods using culture independent methods. Int. J. Food Microbiol. 145, 205–210. https://doi.org/10.1016/j.ijfoodmicro.2010.12.025.

Olano, A., Chua, J., Schroeder, S., Minari, A., La Salvia, M., Hall, G., 2001. *Weissella confusa* (basonym: *Lactobacillus confusus*) bacteremia: a case report. J. Clin. Microbiol. 39 (4), 1604–1607.

Page, A.J., Cummins, C.A., Hunt, M., Wong, V.K., Reuter, S., Holden, M.T., Fookes, M., Falush, D., Keane, J.A., Parkhill, J., 2015. ROARY: rapid large-scale prokaryote pan genome analysis. Bioinformatics 31 (22), 3691–3693.

Pararajasingam, A., Uwagwu, J., 2017. Lactobacillus: the not so friendly bacteria. BMJ case report pii: bcr-2016-218423.

Ptashne, M., Backman, K., Humayun, M.Z., Jeffrey, A., Maurer, R., Meyer, B., Sauer, R.T., 1976. Autoregulation and function of a repressor in bacteriophage lambda. Science 194 (4261), 156–161.

Quattrini, M., Korcari, D., Ricci, G., Fortina, M.G., 2020. A polyphasic approach to characterize *Weissella cibaria* and *Weissella confusa* strains. J. Appl. Microbiol. 128 (2), 500–512.

Reis, N.A., Saraiva, M.A., Duarte, E.A., de Carvalho, E.A., Vieira, B.B., Evangelista-Barreto, N.S., 2016. Probiotic properties of lactic acid bacteria isolated from human milk. J. Appl. Microbiol. 121 (3), 811–820.

Riebel, W.J., Washington, J.A., 1990. Clinical and microbiologic characteristics of pediococci. J. Clin. Microbiol. 28 (6), 1348–1355.

Roberts, T.M., Shimatake, H., Brady, C., Rosenberg, M., 1977. Sequence of Cro gene of bacteriophage lambda. Nature 270 (5634), 274–275.

Salimnia, H., Alangaden, G.J., Bharadwaj, R., Painter, T.M., Chandrasekar, P.H., Fairfax, M.R., 2011. *Weissella confusa*: an unexpected cause of vancomycin-resistant gram-positive bacteremia in immunocompromised hosts. Transpl. Infect. Dis. 13 (3), 294–298.

Sauer, R.T., Yocum, R.R., Doolittle, R.F., Lewis, M., Pabon, C.O., 1982. Homology among DNA-binding proteins suggests use of a conserved super-secondary structure. Nature 298 (5873), 447–451.

Seeman, T., 2014. Prokka: rapid prokaryotic genome annotation. Bioinformatics 30 (14), 2068–2069.

Shin, J.H., Kim, D.I., Kim, H.R., Kim, D.S., Kook, J.K., Lee, J.N., 2007. Severe infective endocarditis of native valves caused by *Weissella confusa* detected incidentally on echocardiography. J. Inf. Secur. 54 (3), e149–e151.

Spiegelhauer, M.R., Yusibova, M., Rasmussen, I.K.B., Fuglsang, K.A., Thomsen, K., Andersen, L.P., 2020. A case report of polymicrobial bacteremia with *Weissella confusa* and comparison of previous treatment for successful recovery with a review of the literature. Access Microbiology 2020, 2. https://doi.org/10.1099/acmi.0.000119.

Srionnual, S., Yanagida, F., Lin, L.H., Hsiao, K.N., Chen, Y.S., 2007. Weissellicin 110, a newly discovered bacteriocin from *Weissella cibaria* 110, isolated from plaa-som, a fermented fish product from Thailand. Appl. Environ. Microbiol. 73, 2247–2250. https://doi.org/10.1128/AEM.02484-06.

Sturino, J.M., 2018. Literature-based safety assessment of an agriculture- and animal-associated microorganism: *Weissella confusa*. Regul. Toxicol. Pharmacol. 95, 142–152.

Sullivan, A., Nord, C.E., 2006. Probiotic lactobacilli and bacteraemia in Stockholm. Scand. J. Infect. Dis. 38 (5), 327–331.

Svec, P., Sevcíková, A., Sedlácek, I., Bednárová, J., Snauwaert, C., Lefebvre, K., Vandamme, P., Vancanneyt, M., 2007. Identification of lactic acid bacteria isolated from human blood cultures. FEMS Immunology & Medical Microbiology. 49 (2), 192–196.

Turnidge, J., Paterson, D.L., 2007. Setting and revising antibacterial susceptibility breakpoints. Clin. Microbiol. Rev. 20, 391–408.

Turnidge, J., Kahlmeter, G., Kronvall, G., 2006. Statistical characterization of bacterial wild-type MIC value distributions and determination of epidemiological cut-off values. Clin. Microbiol. Infect. 12, 418–425.

Vasquez, A., Pancholi, P., Balada-Llasat, J.M., 2015. Photo quiz: confusing bacteremia in a Crohn's disease patient. *Weissella confusa*. Journal of clinical microbiology 53(3): 759.

Xu, X., Luo, D., Bao, Y., Liao, X., Wu, J., 2018. Characterization of diversity and probiotic efficiency of the autochthonous lactic acid bacteria in the fermentation of selected raw fruit and vegetable juices. Frontiers in Microbiology 9. https://doi.org/10.3389/fmicb.2018.02539.

Zheng, J., Wittouck, S., Salvetti, E., Franz, C.M.A.P., Harris, H.M.B., Mattarelli, P., O'Toole, P.W., Pot, B., Vandamme, P., Walter, J., Watanabe, K., Wuyts, S., Felis, G. E., Gänzle, M.G., Lebeer, S., 2020. A taxonomic note on the genus *Lactobacillus*: Description of 23 novel genera, emended description of the genus *Lactobacillus* Beijerinck 1901, and union of *Lactobacillaceae* and *Leuconostocaceae*. Int. J. Syst. Evol. Microbiol. https://doi.org/10.1099/ijsem.0.004107. Apr 15.

Discussion

The explanation and building of rationale of use of microbial food cultures in the food chain highlights the importance in doing a benefit – risk assessment when considering the potential role of a microbial strain of interest, or when investigating the diversity of the food microbiota for the technological role of the present microbial species.
A specific focus is expected on the (body of) knowledge around the microbial species present. These microorganisms should not be considered as safe by design: more understanding and sound evidence is needed about their introduction in the food chain. They do not harbour necessarily *per se* specific unwanted properties such as those assessed when it comes to the hazard characterization of microorganisms of concerns such as food borne pathogens, but it does not mean that a little consideration is needed, particularly when considering the use of a non-usual food matrices, or a specific population with medical conditions and underlying factors prone to adverse effects.

Intrinsic as well as extrinsic factors must be properly considered and addressed: the interaction with the ecological niche, essentially the food matrices they are usually associated with, but also the human host. The approach and understanding of microbial ecology are particularly different between food microbiologists and clinical microbiologists. Due to their isolation in human samples and correlation with various health situations, some of them severe if not fatal, these food cultures species are eventually considered by clinical microbiologists as opportunistic pathogens, leading to regulatory approaches often provoking barriers to trade for fermented food products. Depending of the competent authorities, ministry of health or ministry of agriculture, both covering the area of food safety (similarly to WHO and FAO), the management decision can be particularly different, despite being based on the same evidence.

The usual segmentation of the risk assessment (FAO, 2007) into hazard identification, hazard characterization exposure assessment and risk characterization has its limits when it comes to microbial food cultures and probiotics. For the latter, guidelines are in place since 2001 and 2002, and reinforced by the International Scientific Association of Probiotics and Prebiotics (ISAPP) and the International Probiotics Association (IPA) more recently (Hill et al., 2014; Binda et al., 2020). Food Cultures per se do not have such strict guidelines, not to mention a regulatory hesitance between additives or ingredients (Laulund et al., 2017). As mentioned earlier, and addressed e.g. by the International Dairy

Federation in the initiative of the inventory of food cultures, or the EFSA BIOHAZARD Panel for the QPS evaluation, the establishment of the history of safe use (when it will be clearly agreed upon what history mean in this evaluation) is the approach used by food safety and regulatory authorities to "mimic" the exposure assessment. `The gap between these approaches is mostly due to the understanding in what makes a history of safe use.

What about the hazard characterisation part? The role of the host, and precisely the gut microbiota is a new area of investigation for food safety authorities such as the European Food Safety Authority (EFSA) (Merten et al., 2020) and the Food and Agriculture Organisation of the United Nations (FAO) – Sustainable Development Goals 2 & 3 (FAO, 2019). We are not all equal when it comes to infectious diseases, and this might not be all about our immune system. Whether one does consider the potential risk of opportunistic infections of microbial food cultures, or the use as biotherapeutic agents for specific medical purpose, the sensitivity of the host as a halobiont must be properly considered in the conditions of use of the microbial food cultures, and or the fermented food products. The diet has been studied most recently for its influence and capacity to modulate the gut microbiome (Wastik et al., 2021), which in turn can impact among other effects the human immune system. All is not bad about a slightly oriented microbial stimulation, but considerations of use need to be properly addressed. The EFSA Panel on Additives and Products or Substances used in Animal Feed (FEEDAP) Guidance on the characterisation of microorganisms used as feed additives or as production organisms (FEEDAP, 2018) should indeed be followed, but there are only providing a part of the work that must be done to ensure a safe use of microbial food cultures, and the guidance do not apply to undefined food cultures and spontaneous fermentation processes. There is a need to compile and harmonize the global knowledge of microbial food cultures, as the science of food fermentation and "positive" microorganisms has grown very enthusiastically in the recent years, while something getting over essential points of precaution.

Underlying factors and specific health conditions of concern vs. opportunistic infections.

Among the 1000 hundred and plus of case reports found in the literature for the genera *Lactobacillus*, *Leuconostoc*, *Lactococcus*, *Weissella* and *Bifidobacteria*, circa 50-80 of them were directly correlated with the consumption of probiotic food products (D'Agostin et al., 2021; Topcuoglu et al., 2015), where in some cases, the clinical team made the clear evidence through Whole Genome Sequencing (WGS) between the probiotic strain of the food product and the clinical isolate (Pararajasingam and Uwagwu, 2017). In several reports, the clinical isolate had not been compared to the probiotic strain consumed, and definitive conclusion could therefore not be done to consider the causative agent being the food product (Tommasi et aL., 2008). With the implementation of molecular typing, the major breakthrough of Next Generation Sequencing (NGS) since 2012, and awareness of the health care practitioners, one might expect the epidemiology to be effectively done and allow proper conclusion (Aroutcheva et al., 2016)

In the recent case reports, the authors usually see to propose a review of the previously published reported cases, but none of the reviews done provide the same exhaustivity as the approach proposed presently to review several databases, global web search by general keywords and investigations of the hits, searching for cross references. This confirm the limits and pitfalls of expecting to be exhaustive when using (partially) only one source of information. On top of the difficulty to gather the available yet scattered evidence, the lactic acid bacteria infection cases are underreported by design by health care practitioners, because of inadequate screening techniques (aerobic incubation on blood agar plate) that cannot be efficient for the isolation of the specific growth conditions of these microorganisms, most specifically *Bifidobacterium*. Nevertheless, some publications about endocarditis, the most severe condition of infection caused by lactic acid bacteria, see to provide an estimate of 0.02% to 0.4% of global endocarditis caused by lactic acid bacteria. Considering the exposure of the population to lactic acid bacteria, it is therefore anticipated to conclude to a significant and concerning pathogenic potential, most particularly when underlying factors are often if not always identified such as diabetes mellitus, liver cirrhosis, history of valves replacement, invasive procedures, poor dental hygiene, immune compromised status among the most reported ones (Rossi et al., 2019). Nevertheless, the risk, despite being low, is far from being negligible and specific considerations, education and awareness of the clinical microbiologists as well as the producers are needed.

Opportunistic infections and microbial food cultures: guidelines to heath care practitioners

Probiotic strains are expected to be introduced in the food chain for the generally healthy population. In case of use of a microbial strain for a specific targeted population for medical purposes, this is not the definition of a probiotic strain *per se* but a therapeutic agent, as mentioned in the 2002 FAO/WHO Expert report and presently in place e.g. in the United States (Cordaillat-Simon et al., 2020; Rouanet et al., 2020). In the late 2000's, Probiotics gain interest for their use in specific medical conditions, e.g. *Clostridium difficile* infection following the initiative and publication from a UK health care practitioners' team (Hickson et al., 2007). Since then, the use (and marketing) of probiotics has boomed for this type of conditions. Considering the specific population and its poor health conditions, the concomitant use of vancomycin as first line treatment of *C. difficile* infection but natural resistance from most lactic acid bacteria, the benefit risk assessment should not have been overlooked. Several inappropriate applications of probiotics were reported, mostly through case reports, which highlights the need to have a clear consideration of use of microbial cultures before their use (Liu et al., 2020; Pace et al., 2020). Of all mis-abuses, the PROPATRIA study in 2004 - 2008 was the most "advanced" in the lack of reflection upon the considerations of use (Bongaerts and Severijnen, 2016), while it is recommended for such type of population to consider a low microbial diet (Lund, 2014).

By definition, there cannot be a clinical study of a probiotic strain in medical settings or specific at-risk populations. These are biotherapeutic agents, and do not fall under the regulation considerations of a food product but a drug. Probiotic strain, as defined by the FAO/WHO expert report, are designed for generally healthy population and regulated as food products. On top of having to be produced in different manufacturing setting, not under a Food Safety Management System (FSMS) but according to cGMP (Current Good Manufacturing Practices), it is the responsibility of the manufacturing producer to provide clear guidelines of use of the biotherapeutic agent, not to mention the antibiotic resistance profile of the microorganisms of interest (Castro-González et al., 2019)

It is indeed a common practice in clinical setting to use vancomycin as a first line treatment of antibiotic prophylaxis against bacterial infection. While this does make sense eventually against *C. difficile*, it is counterproductive for lactic acid bacteria which are most commonly resistant to this antibiotic, therefore leading to a gut disbalance, overgrowth of lactic acid bacteria in this ecological niche, translocation through the gut barrier into the vena portae and liver infection. This is why liver cirrhosis, diabetes mellitus and organ failure are reported as causative agents of opportunistic infection to lactic acid bacteria, which is of particular risk when considering the concomitant use with probiotic consumption. When considering probiotic prophylaxis, and promoting medical purposes, it is the responsibility of the marketing company to inform, based on the available evidence, about the risk of opportunistic infection, the need for correct identification and the anticipated intravenous ampicillin treatment in case of lactobacillemia, as empirically done and reported in the case reports.

A better screening methodology would also be needed, to identify viable but non cultivable cells, and avoid the specific growth conditions on agar media and the bias of culture-based techniques. As such, screening techniques based on molecular methodologies seem more relevant and efficient to clearly identify, in the onset of fever and sepsis, the causative agent(s) (Peri et al., 2021).

Food Fermentation as end use of microbial food cultures

The one health approach is particularly under scrutiny during the COVID19 pandemic. Of one of the major concerns linked to the use of microbial organisms is the antibiotic resistance and the potential of transfer of genes. The ACE-ART European project proposed in the mid 2000's Minimal Inhibitory Concentrations (MIC) values for the most commonly used lactic acid bacteria. These requirements remain still today a major topic of surveillance, either for food cultures (Zarzecka et al., 2020) or probiotics (Daniali et al., 2020).
The present ACE-ART cut offs are still presently used and required by the EFSA FEEDAP Panel.

In the FAO/WHO expert report, 2001 and 2002, in the International Dairy Federation initiative, or in the EFSA BIOHAZARD QPS evaluation, the end use is necessarily considered when it comes to assessing the introduction of a microbial food culture in the food chain, and ultimately, the human host. Food fermentation and the mechanism of action in the fermentation process has been driven mostly by a "black box" approach, where the evidence was more than limited when available. Sir John Lister in the late 19^{th} century established the role of *Lactococcus lactis* (by then, *Bacterium lactis*) in the lactic acid fermentation of milk, yet at this time not in the objective of understanding food fermentation (Santer, 2010) but to prove a point *vs.* the infectivity of bacteria in humans.

The major hurdle remains the lack of consensus on the approach on food fermentation. Some 20 years ago, the Food and Agriculture initiated a work on the global diversity on fermented foods (Battcock et al., 1998; Haard et al., 1999; Deshpande et al., 2000), while the World Health Organisation focused on the potential role of microbial food cultures in biopreservation to address among other control measures safe food production (Motarjemi et al., 1995). The International Dairy Federation, in collaboration with the European Food and Feed Cultures Associations took the lead on similar initiative for the dairy food products, and lastly enlarged to all type of food matrices (Mogensen et al., 2002a, 2002b; Bourdichon et al., 2012a, 2012b, 2012c, 2012d, 2018). The International Scientific Association on Probiotics and Prebiotics also investigated this topic (Marco et al., 2021).

Despite all these numerous publications, expert reports, global symposia, there is still a lack in alignment on definition on what is understood (and should be in fine regulated and supervised) as food fermentation and the role in the food chain. This topic is far from being solely a linguistic issue, there are lot of implications in the classification of fermented foods and microbial food cultures. Presently in

Europe, there is a status quo on the classification, where it is not obvious to know if a food culture is an additive or an ingredient, and a food product is novel food product or not.
Precise fermentation is one of the new (marketing not so scientific) concept recently proposed for the production of a food component by a microorganism (most generally a genetic engineered one). This is a new application of industrial engineered fermentation, not applied this type to medical and pharma ingredients. How should this be assessed under the EU 178/2002 regulation, and classification as a GMO component or not.

Cross-over fermentation has recently been conceptualized by the Dutch scientists of Wageningen University (Dank et al., 2021), this approach has also been promoted also from other sectors such as the wine industry (Capozzi et al., 2021). But what about the history of use when changing the usual food matrix? Should this still be considered as a traditional use or be considered as a novel food? For the time being, the consumer trend, marketing opportunity and lack of concern has provided a marketing opportunity to skip the regulatory assessment, until an issue arise. Alternative protein sources by new fermentation processes means new epitopes, hence new allergies. The use of pea protein for "alternative cheeses" might look promising, but remains to be properly addressed (while it is presently not the case). This lack of consideration could endanger this new area of food production and should be considered by the industrial players before regulatory authorities or consumer associations ask for a better supervision.

Health promoting effect of fermented foods: Food Cultures and Gut Health

In the consideration of new food fermentation processes and the development of new fermented food products, consumer acceptance is a key element of consideration in access to market. The understanding by the uneducated consumer of the potential role of food cultures and fermented food challenge the historical acceptance millennials ago and the empirical transmission of food products.

The proposed roles of food fermentation as stated in the introduction are *a posteriori*: it cannot be proposed that 10 000 years ago, the acceptance was a priori with clear evidence of the role of the "ferment" or "starters" without an understanding of microbiology. We initially suggested extension of shelf life as the initial driver for fermented food products. Taste needs trying and time, it is a whole education process. The health promoting effect however is something also widely accepted, and should not be overlooked by the recent aggressive marketing campaign, mostly in the western societies. The

consumption of fresh dairy food products in Western Europe is very recent, circa a century only, and motivated by the early work of Elie Metchnikoff in his 1907 edited "Essais Optimistes" (wrongly translated "the prolongation of life"). For other civilisations, this is however known and incorporated in the culture for longer than this.
The rise in the 1920's in Europe of fresh dairy products consumptions was preceded in the 16th century episode of Soleyman the magnificent, sultan of the ottoman empire, sending his personal doctors with his sheep to the court of François the first, king of France, to cure him from gut disorders (Rul, 2017).

The rise of science around probiotic strains and the potential health effect at the species level (Hill et al., 2014) has caused an interest and rediscovery of the health properties of fermented food products (Kim et al., 2021; Wastik et al., 2021). This recent trend has also seen the emergence of new trendy terms such as postbiotics, where the food technologists were used to more technical (but indeed less appealing ones) such as fermentates (Mathur et al., 2020).

Despite more than 100 years of application in the food chain, and numerous publications, the science around probiotic food products and the products themselves remain very heterogenous. The numerous refusals of the health claim dossier submitted to the European Food Safety Authority because of lack of characterization are not considered enough by the industry players that better rules and discipline should be enforced, and avoid jeopardizing a global sector by the lack of discipline of minor players. As such, the Codex Initiative (Argentina, Malaysia) on guidelines of probiotics remain a key opportunity to put things in order and move forward to ensure consumer protection (safe products and substantiated health claims). The difficulty to get the initiative adopted is also a sign that the situation is more confusing than anything.

Beyond science: A need for consensus definition and a standardization scheme

When starting to gather the scientific evidence to build a position, one does appreciate to have the possibility to use commonly agreed terms, in order to work with strong recognized evidence. In the area of research of microbial food cultures, and microorganisms voluntarily introduced in the food chain, this is unfortunately far from being the case.

“Probiotic” has been defined in the 2001/2002 FAO/WHO Expert report, and reconfirmed by an ISAPP initiative in 2014 by Hill and cowriters. There is presently an initiative at the Codex Committee on Nutrition and Foods for Special Dietary Uses to add in the program of work guidelines on probiotics to get consensus on the definition.

Bacterial food cultures are defined in the ISO 27205 – IDF 149 (2010) standard Fermented milk products - Bacterial starter cultures - Standard of identity (https://fil-idf.org/publications/standards/fermented-milk-products-bacterial-starter-cultures-standard-of-identity-2/).

In microbial taxonomy, under supervision of the International Union of Microbial Societies, there is quite surprisingly not a consensus definition for species and strain. When it comes to the recent proliferation of biotics terms, beyond the established probiotics and prebiotics definition, there is no globally agreed and recognized definition, as seen by the recent “hesitations” around the concept of postbiotics (Aguilar-Toalá et al., 2021; Salminen et al., 2021a, 2021b).

How far should we, or even can we go to understand the unknown around food fermentation processes? There is indeed a global industrialized approach with defined food cultures to produce fermented foods, but the use of undefined cultures, despite being eventually a niche market, will continue due to their major incorporation in local culture (such as PDO products).

When it comes to specific strain productions, the responsibility of the producer is clearly regulated (e.g. given in Europe, Article 14 of the EU178/2002 regulation), putting the onus of the responsibility to ensure safe production. A scientific dossier is to be established (and it is usually) case by case for each strain.

For more traditional empirical processes, health authorities have to put a balance between ensuring safe production and not putting an unacceptable burden on small producers, who most generally do not have the awareness on the topic and capability to answer.

Conclusion

Despite their variety and wide consumption around the world with full integration in the global heritage of the different cultures, indigenous fermented foods remain still today unelucidated in their manufacturing process and internal mode of actions.

After more than 10 000 years of daily consumption and despite the considerable advances in science, the approach of food fermentation remains very empirical. With the breakthrough in microbiology in the last 150 years, one would have expected the interactions to be largely understood and easily reproducible. It is far from being the case today, and the mystery is about to last for a while.

Fermented food products represent nevertheless a huge opportunity to ensure global food security. Several international organisations have been implicated in this approach in the last 20 years: Food and Agriculture Organisation, "Office International de l'Elevage", World Health Organisation, International Dairy Federation, and the academic world. They are also a major business opportunity, with major world-wide companies having built their business on the science of "good bacteria" (but also fungi and yeasts).

The major barrier to trade on fermented foods and microbial food cultures remains today the lack of harmonization in regulation, not to say bluntly the lack of regulation. Regulation is expected to be science based, and the science of food microbiology as such has not reached full maturity yet. There is a need to widen the scope, get away from the Western oriented vision and have an exhaustive approach on fermentation. The recent trend from the Western world on plant-based fermentation should not obliterate those plants (cereals, vegetables, seeds, legumes, …) have been the most used matrix for food fermentation from the beginning. Dairy is "just" a part of the global diversity.

While scientists explore or rediscover the use of microbial food cultures, the safety demonstration should be fully integrated in the new product development. Lack of clear regulation (and therefore supervision) does not allow still food business operators to do an integrated (adapted) risk analysis and fully understand the opportunities and limits of microbial food cultures in the food chain. Standardization of processes and methods in the coming year are expected to provide a rationalized frame for continuing to produce safe food for everyone.

References

Aguilar-Toalá, J.E., Arioli, S., Behare, P., Belzer, C., Berni Canani, R., Chatel, J.M., D'Auria, E., de Freitas, M.Q., Elinavn E., Esmerinon E.A., Garcían H.S., da Cruz, A.G., González-Córdovan A.F., Guglielmetti, S., de Toledo Guimarães, J., Hernández-Mendoza, A., Langella, P., Liceagan A.M., Magnani, M., Martinn R., Mohamad Lal, M.T., Mora, D., Moradi, M., Morelli, L., Mosca, F., Nazzaro, F., Pimentel, T.C., Ran, C., Ranadheera, C.S., Rescigno, M., Salas, A., Sant'Ana, A.S., Sivieri, K., Sokoln H., Taverniti, V., Vallejo-Cordoba, B., Zelenkan J., and Zhou, Z., 2021. Postbiotics - when simplification fails to clarify. Nature Reviews Gastroenterology & Hepatology (11):825-826. doi: 10.1038/s41575-021-00521-6. PMID: 34556825.

Aroutcheva, A., Auclair, J., Frappier, M., Millette, M., Lolans, K., de Montigny, D., Carrière, S., Sokalski, S., Trick, W.E., and Weinstein, R.A., 2016. Importance of Molecular Methods to Determine Whether a Probiotic is the Source of *Lactobacillus* Bacteremia. Probiotics and Antimicrobial Proteins (1):31-40. doi: 10.1007/s12602-016-9209-y.

Battcock, M., and Azam-Ali, D., 1998. Fermented frutis and vegetables. A global perspective. FAO agricultural services bulletin No. 134 (Available at: https://www.fao.org/3/x0560e/x0560e00.htm)

Binda, S., Hill, C., Johansen, E., Obis, D., Pot, B., Sanders, M.E., Tremblay, A., and Ouwehand, A.C., 2020. Criteria to Qualify Microorganisms as "Probiotic" in Foods and Dietary Supplements. Frontiers in Microbiology 11:1662. doi: 10.3389/fmicb.2020.01662.

Bongaerts, G.P., Severijnen, R.S., 2016. A reassessment of the PROPATRIA study and its implications for probiotic therapy. Nature Biotechnology 34(1):55-63. doi: 10.1038/nbt.3436. PMID: 26744983.

Borriello, S.P., Hammes, W.P., Holzapfel, W., Marteau, P., Schrezenmeir, J., Vaara, M., Valtonen, V., 2003. Safety of probiotics that contain lactobacilli or bifidobacteria. Clinical Infectious Diseaes 5;36(6):775-80.

Bourdichon, F., Casaregola, S., Farrokh, C., Frisvad, J.C., Gerds, M.L., Hammes, W.P., Harnett, J., Huys, G., Laulund, S., Ouwehand, A., Powell, I.B., Prajapati, J.B., Seto, Y., Ter Schure, E., Van Boven, A., Vankerckhoven, V., Zgoda, A., Tuijtelaars, S., Hansen, E.B., 2012a. Food fermentations: microorganisms with technological beneficial use. Int J Food Microbiol 154(3) 87-97. https://www.sciencedirect.com/science/article/pii/S0168160511007586

Bourdichon, F., Berger, B., Casaregola, S., Farrokh, C., Frisvad, J.C., Gerds, M.L., Hammes, W.P., Harnett, J., Huys, G., Kleerebezem, M., Laulund, S., Ouwehand, A., Powell, I.B., Prajapati, J.B., Seto, Y., Ter Schure, E., Van Boven, A., Vankerckhoven, V., Zgoda, A., Bech Hansen, E., 2012b. A Safety Assessment of Microbial Food Cultures with History of Use in Fermented Dairy Products. Bulletin of IDF 455, 2-12. https://store.fil-idf.org/product/safety-demonstration-of-microbial-food-cultures-mfc-in-fermented-food-products-2/

Bourdichon, F., Berger, B., Casaregola, S., Farrokh, C., Frisvad, J.C., Gerds, M.L., Hammes, W.P., Harnett, J., Huys, G., Laulund, S., Ouwehand, A., Powell, I.B., Prajapati, J.B., Seto, Y., Ter Schure, E., Van Boven, A., Vankerckhoven, V., Zgoda, A., Bech Hansen, E., 2012c. Building an Inventory of Microbial Food Cultures with a Technological Role in Fermented Food Products. Bulletin of IDF 455, 13-21. https://store.fil-idf.org/product/safety-demonstration-of-microbial-food-cultures-mfc-in-fermented-food-products-2/

Bourdichon, F., Boyaval, P., Casaregola, S., Dupont, J., Farrokh, C., Frisvad, J.C., Hammes, W.P., Huys, G., Jany, J.L., Laulund, S., Ouwehand, A., Seto, Y., Zgoda, A., Bech Hansen, E., 2012d. The 2012 Inventory of Microbial Species with Technological Beneficial Role in Fermented Food Products. Bulletin of IDF 455, 22-61. https://store.fil-idf.org/product/safety-demonstration-of-microbial-food-cultures-mfc-in-fermented-food-products-2/

Bourdichon, F., Alper, I., Bibiloni, R., Dubois, A., Laulund, S., Miks, M., Morelli, L., Zuliani, V., Yao, S., 2018. Inventory of Microbial Food Cultures with safety demonstration in fermented food products. Update of the Bulletin of the IDF 455-2012. Bulletin of IDF 495 -2018, https://store.fil-idf.org/product/bulletin-idf-n-495-2018-inventory-microbial-food-cultures-safety-demonstration-fermented-food-products/

Bourdichon, F., Laulund, S., Tenning, P., 2019. Inventory of microbial species with a rationale: a comparison of the IDF/EFFCA inventory of microbial food cultures with the EFSA Biohazard Panel qualified presumption of safety. FEMS Microbiology Letters 366(5):fnz048. doi: 10.1093/femsle/fnz048. PMID: 30839062.

Bundesinstitut für Gesundheitlichen Verbraucherschutz und Veterinärmedizin, Final report of the BgVV Working Group "Probiotic Microorganism Cultures in Food". Bundes Federal Riskbewertung Büro. http://www.bfr.bund.de/cm/349/probiotika_en.pdf

Capozzi, V., Fragasso, M., Romaniello, R., Berbegal, C., Russo, P., Spano, G., 2017. Spontaneous Food Fermentations and Potential Risks for Human Health. Fermentation 3(4):49. https://doi.org/10.3390/fermentation3040049

Capozzi, V., Fragasso, M., Russo, P., 2020. Microbiological Safety and the Management of Microbial Resources in Artisanal Foods and Beverages: The Need for a Transdisciplinary Assessment to Conciliate Actual Trends and Risks Avoidance. Microorganisms 8(2):306. doi:256 10.3390/microorganisms8020306. PMID: 32098373; PMCID: PMC7074853.

Capozzi, V., De Simone, N., Fragasso, M., Perrone, G., Biasoli, F., Spano, G., Russo, P., Tufariello, M., and Grieco, F., 2021. Wine microbial diversity and cross-over applications: emerging results and future perspectives. Poster Macrowine 2021.

Castro-González, J.M., Castro, P., Sandoval, H., and Castro-Sandoval, D., 2019. Probiotic Lactobacilli Precautions. Frontiers Microbiology 12;10:375. doi: 10.3389/fmicb.2019.00375. PMID: 30915041

Cordaillat-Simmons, M., Rouanet, A. and Pot, B., 2020. Live biotherapeutic products: the importance of a defined regulatory framework. Experimental and Molecular Medicine 52, 1397–1406. https://doi.org/10.1038/s12276-020-0437-6

D'Agostin, M., Squillaci, D., Lazzerini, M., Barbi, E., Wijers, L., and Da Lozzo, P., 2021. Invasive Infections Associated with the Use of Probiotics in Children: A Systematic Review. Children 8(10):924. doi: 10.3390/children8100924. PMID: 34682189; PMCID: PMC8534463.

Daniali, M., Nikfar, S., and Abdollahi, M., 2020. Antibiotic resistance propagation through probiotics. Expert Opinion on Drug Metabolism & Toxicology 12):1207-1215. doi: 10.1080/17425255.2020.1825682. Epub 2020 Sep 27. PMID: 32938241.

Dank, A., van Mastrigt, O., Yang, Z., Dinesh, V.M., Lillevang, S.K., Weij, C., Smid, E.J., 2021. The cross-over fermentation concept and its application in a novel food product: The dairy miso case study. LWT Vol142 ISSN 0023-6438, https://doi.org/10.1016/j.lwt.2021.111041.

Deshpande, S.S.; FAO, Rome (Italy). Agricultural Support Systems Div. eng; Salunkhe, D.K.; Oyewole, O.B. et al.2000. Fermented grain legumes, seeds and nuts: a global perspective. FAO Agricultural Services Bulletin, No. 142

Domig, K.J., Mayrhofer, S., Huys, G., Tosi, L., Danielsen, M., Mayo, B., Axelsson, L., Korhonen, J., Egervärn, M., Bardowksi, J., Saarela, M., Morelli, L., and Kneifel, W., 2008. The ACE-ART database - Antibiotic susceptibility of lactic acid bacteria and bifidobacteria in relation to their biological, geographical and chronological origin. International Journal of Probiotics and Prebiotics 3(4):281-286

EFSA BIOHAZ Panel (EFSA Panel on Biological Hazards), Ricci, A., Allende, A., Bolton, D., Chemaly, M., Davies, R., Fernandezn Escamez, P.S., Girones, R., Koutsoumanis, K., Lindqvist, R., Nørrung, B., Robertson, L., Ru, G., Sanaa, M., Simmons, M., Skandamis, P., Snary, E., Speybroeck, N., Ter Kuile, B., Threlfall, J., Wahlstrom, H., Cocconcelli, P.S., Peixe, L., Maradona, M.P., Querol, A., Suarez, J.E., Sundh, I., Vlak, J., Barizzone, F., Correia, S. and Herman, L., 2018. Statement on the update of the list of QPS-recommended biological agents intentionally added to food or feed as notified to EFSA 8: suitability of taxonomic units notified to EFSA until March 2018. EFSA Journal 2018;16(7):5315, 42 pp. https://doi.org/10.2903/j.efsa.2018.5315

FAO and WHO, 2001. Report on Joint FAO/WHO expert consultation on evaluation of health and nutritional properties of probiotics in food including powder milk with live lactic acid bacteria. Cordoba, Argentina, 1-4 October 2001. Available at: https://www.fao.org/3/y6398e/y6398e.pdf (accessed November 30, 2021)

FAO and WHO, 2002. Guidelines for the evaluation of probiotics in Food. Joint FAO/WHO Workgroup on Drafting Guidelines for the Evaluation of Probiotics in Food. London, Ontario, Canada, April 30 and May 1, 2002. Available at: https://www.who.int/foodsafety/fs_management/en/probiotic_guidelines.pdf (accessed November 30, 2021)

FAO and WHO, 2006. Health and nutritional properties and guidelines for evaluation - Report of a Joint FAO/WHO Expert Consultation on Evaluation of Health and Nutritional Properties of Probiotics in Food including Powder Milk with Live Lactic Acid Bacteria. Available at: https://www.fao.org/publications/card/fr/c/7c102d95-2fd5-5b22-8faf-f0b2e68dfbb6/ (accessed November 30, 2021)

FAO, 2007. Food safety risk analysis: A guide for national food safety authorities. Available at: https://www.fao.org/3/a0822e/a0822e.pdf (accessed November 30, 2021)

FAO, 2019. Microbiome: the missing link? Available at: https://www.fao.org/documents/card/fr/c/ca6767en/ (Accessed on November 30, 2021)

Falkow, S., 1988. Molecular Koch's postulates applied to microbial pathogenicity. Reviews of Infectious Diseases. Suppl 2:S274-6. doi: 10.1093/cid/10. supplement_2.s274. PMID: 3055197.

FEEDAP Panel, EFSA. 2018. Guidance on the characterisation of microorganisms used as feed additives or as production organisms. EFSA Journal 2018;16(3):5206

Gasser, F., 1994. Safety of lactic acid bacteria and their occurrence in human clinical infections [opportunistic bacteria, various infections]. Bulletin de l'Institut Pasteur (France) Vol 92 Issue 1 45-67

Haard, N.F., Odunfa; S.A., Lee, C.H., Quintero-Ramirez, R., Lorence-Quiñones, A., and Wacher-Radarte, C., 1999. Fermented cereals. A global perspective. FAO agricultural services bulletin No. 138. (Available at: https://www.fao.org/3/x2184e/x2184e00.htm)

Health Canada, 2003. Amendment (Schedule No. 948) to Division 28 of the Food and Drug Regulations, Sections B.28.001–003. Food and Drugs Regulations.

Herman, L., Chemaly, M., Cocconcelli, P.S., Fernandez, P., Klein, G., Peixe, L., Prieto, M., Querol, A., Suarez, J.E., Sundh, I., Vlak, J., and Correia, S., 2018. The qualified presumption of safety assessment and its role in EFSA risk evaluations: 15 years past. FEMS Microbiology Letters, Volume 366, Issue 1, 1 January 2019, fny260. https://academic.oup.com/femsle/article/366/1/fny260/5237703

Hickson, M., D'Souza, A.L., Muthu, N., Rogers, T.R., Want, S., Rajkumar, C., and Bulpitt, C.J., 2007. Use of probiotic Lactobacillus preparation to prevent diarrhoea associated with antibiotics: randomised double blind placebo controlled trial. BMJ 335(7610):80. doi: 10.1136/bmj.39231.599815.55. Epub 2007 Jun 29. PMID: 17604300

Hill, C., Guarner, F., Reid, G., Gibson, G.R., Merenstein, D.J., Pot, B., Morelli, L., Canani, R.B., Flint, H.J., Salminen, S., Calder, P.C., and Sanders, M.E., 2014. Expert consensus document. The International Scientific Association for Probiotics and Prebiotics consensus statement on the scope and appropriate use of the term probiotic. Nature Reviews Gastroenterology and Hepatology 11(8):506-14. doi: 10.1038/nrgastro.2014.66.

Hurt, W., Savarimuthu, S., Mughala, N., and Moore, L.S.P., 2021. A rare case of *Weissella confusa* endocarditis. Clinical Infection in Practice 12 (2021) 100078

Kim, J.; Burton-Pimentel, K.J.; Fleuti, C.; Blaser, C.; Scherz, V.; Badertscher, R.; Marmonier, C.; Lyon-Belgy, N.; Caille, A.; Pidou, V.; Blot, A.; Bertelli, C.; David, J.; Bütikofer, U.; Greub, G.; Dardevet, D.; Polakof, S.; Vergères, G. Microbiota and Metabolite Modifications after Dietary Exclusion of Dairy Products and Reduced Consumption of Fermented Food in Young and Older Men. Nutrients 2021, 13, 1905. https://doi.org/10.3390/nu13061905

Laulund, S., Wind, A., Derkx, P.M.F., Zuliani, V., 2017. Regulatory and Safety Requirements for Food Cultures. Microorganisms. 5(2):28. doi:10.3390/microorganisms5020028

Leuschner, R.-G.K., Robinson, T., Hugas, M., Cocconcelli, P.S., Richard-Forget, F., Klein, G., Licht, T.R., Nguyen-The, C., Querol, A., Richardson, M., Suarez, J.E., Vlak, J.M., von Wright, A., 2010. Qualified presumption of safety (QPS): a generic risk assessment approach for biological agents notified to the European Food Safety Authority (EFSA). Trends Food Sci. Technol. 21, 425-435.

Liu D, Zeng L, Yan Z, Jia J, Gao J, Wei Y. The mechanisms and safety of probiotics against toxigenic *Clostridium difficile*. Expert Review of Anti-infective Therapy (10):967-975. doi: 10.1080/14787210.2020.1778464. Epub 2020 Jun 16. PMID: 32520637.

Lund, B.M., 2014. Microbiological food safety and a low-microbial diet to protect vulnerable people. Foodborne Pathogen Diseases 11(6):413-24. doi: 10.1089/fpd.2013.1679. Epub 2014 Mar 12. PMID: 24621274.

Marco, M.L., Sanders, M.E., Gänzle, M., Arrieta, M.C., Cotter, P.D., De Vuyst, L., Hill, C., Holzapfel, W., Lebeern S., Merenstein, D., Reid, G., Wolfe, B.E., and Hutkins, R., 2021. The International Scientific Association for Probiotics and Prebiotics (ISAPP) consensus statement on fermented foods. Nature Reviews Gastroenterology & Hepatology, 18(3):196-208. doi: 10.1038/s41575-020-00390-5.

Marteau, P., 2001. Safety aspects of probiotic products, Näringsforskning, 45:1, 22-24, DOI: 10.3402/fnr.v45i0.1785

Mathur, H., Beresford, T.P., and Cotter, P.D., 2020. Health Benefits of Lactic Acid Bacteria (LAB) Fermentates. Nutrients. 12(6):1679. doi: 10.3390/nu12061679. PMID: 32512787; PMCID: PMC7352953.

Merten, C., Schoonjans, R., Di Gioia, D., Pelaez, C., Sanz, Y., Maurici, D., and Robinson, T., 2020. Editorial: Exploring the need to include microbiomes into EFSA's scientific assessments. EFSA Journal 2020;18(6):e18061, 7 pp. https://doi.org/10.2903/j.efsa.2020.e18061

Mofredj, A., Bahloul, H., Chanut, C., 2007. *Lactococcus lactis*: un pathogène opportuniste? [*Lactococcus lactis*: an opportunistic bacterium?]. Médecine et Maladies Infectieuses 37(4):200-7. French. doi: 10.1016/j.medmal.2007.01.005. Epub 2007 Mar 1. PMID: 17336016.

Mogensen, G., Salminen, S., O'Brien, J., Ouwehand, A., Holzapfel, W., Shortt, C., Fonden, R., Miller, G.D., Donohue, D., Playne, M., Crittenden, R., Salvadori, B., Zink, R., 2002a. Food microorganisms - health benefits, safety evaluation and strains with documented history of use in foods. Bulletin of IDF 377, 4-9.

Mogensen, G., Salminen, S., O'Brien, J., Ouwehand, A., Holzapfel, W., Shortt, C., Fonden, R., Miller, G.D., Donohue, D., Playne, M., Crittenden, R., Salvadori, B., Zink, R., 2002b. Inventory of microorganisms with a documented history of use in food. Bulletin of IDF 377, 10-19.

Motarjemi, Y., Nout, M.J.R., on behalf of the Joint FAO/WHO Workshop on Assessment of Fermentation as a Household Technology for Improving Food Safety, 1996. Food fermentation: a safety and nutritional assessment. Bulletin of the World Health Organization, 74 (6): 553-559

Pace, F., Macchini, F., and Massimo Castagna, V., 2020. Safety of probiotics in humans: A dark side revealed? Digestive and Liver Disease 52(9):981-985. doi: 10.1016/j.dld.2020.04.029.

Pararajasingam, A., and Uwagwu, J., 2017. *Lactobacillus*: the not so friendly bacteria. BMJ Case Reports. doi: 10.1136/bcr-2016-218423.

Peri, A.M., Harris, P.N.A., and Paterson, D.L., 2021. Culture-independent detection systems for bloodstream infection. Clinical Microbiology and Infection S1198-743X(21)00602-9. doi: 10.1016/j.cmi.2021.09.039.

Rouanet, A., Bolca, S., Bru, A., Claes, I., Cvejic, H., Girgis, H., Harper, A., Lavergne, S.N., Mathys, S., Pane, M., Pot, B., Shortt, C., Alkema, W., Bezulowsky, C., Blanquet-Diot, S., Chassard, C., Claus, S.P., Hadida, B., Hemmingsen, C., Jeune, C., Lindman, B., Midzi, G., Mogna, L., Movitz, C., Nasir, N., Oberreither, M., Seegers, J.F.M.L., Sterkman, L., Valo, A., Vieville, F., and Cordaillat-Simmons, M., 2020. Live Biotherapeutic Products, A Road Map for Safety Assessment. Frontiers in Medicine 7:237. doi: 10.3389/fmed.2020.00237. PMID: 32637416; PMCID: PMC7319051.

Rossi, F., Amadoro, C., and Colavita, G., 2019. Members of the *Lactobacillus* Genus Complex (LGC) as Opportunistic Pathogens: A Review. Microorganisms. 10;7(5):126. doi: 10.3390/microorganisms7050126.

Rul, F., 2017. Yogurt: microbiology, organoleptic properties and probiotic potential. Fermented Foods, Part II: Technological Interventions, CRC Press, 525 p., 2017, Food Biology Series, 9781138637849. ffhal-01579303f

Salminen, S., Collado, M.C., Endo, A., Hill, C., Lebeer, S., Quigley, E.M.M., Sanders, M.E., Shamir, R., Swann, J.R., Szajewska, H., and Vinderola, G., 2021a. The International Scientific Association of Probiotics and Prebiotics (ISAPP) consensus statement on the definition and scope of postbiotics. Nature Reviews Gastroenterology & Hepatology (9):649-667. doi: 10.1038/s41575-021-00440-6. Epub

2021 May 4. Erratum in: Nat Rev Gastroenterol Hepatol. 2021 Jun 15;: PMID: 33948025; PMCID: PMC8387231.

Salminen, S., Collado, M.C., Endo, A., Hill, C., Lebeer, S., Quigley, E.M.M., Sanders, M.E., Shamir, R., Swann, J.R., Szajewska, H., and Vinderola, G., 2021b. Reply to: Postbiotics - when simplification fails to clarify. Nature Reviews Gastroenterology & Hepatology (11):827-828. doi: 10.1038/s41575-021-00522-5. PMID: 34556824.

Santer, M., 2010. Joseph Lister: first use of a bacterium as a 'model organism' to illustrate the cause of infectious disease of humans. Notes and Records of the Royal Society Journal of the History of Science 64(1):59-65. doi: 10.1098/rsnr.2009.0029.

Spiegelhauer, M.R., Yusibova, M., Rasmussen, I.K.B., Fuglsang, K.A., Thomsen, K., Andersen, L.P., 2020. A case report of polymicrobial bacteremia with *Weissella confusa* and comparison of previous treatment for successful recovery with a review of the literature. Access Microbiology 2020, 2. https://doi.org/10.1099/ acmi.0.000119.

Steinkraus, K.H., 2002. Fermentations in World Food Processing. Comprehensive Reviews in Food Science and Food Safety, Vol 1, 2002, 23-32.

Tommasi, C., Equitani, F., Masala, M., Ballardini, M., Favaro, M., Meledandri, M., Fontana, C., Narciso, P., and Nicastri, E., 2008. Diagnostic difficulties of Lactobacillus casei bacteraemia in immunocompetent patients: a case report. Journal of Medical Case Reports 2:315. doi: 10.1186/1752-1947-2-315. PMID: 18826603

Topcuoglu, S., Gursoy, T., Ovalı, F., Serce, O., and Karatekin, G., 2015. A new risk factor for neonatal vancomycin-resistant Enterococcus colonisation: bacterial probiotics. The Journal of Maternal-Fetal & Neonatal Medicine (12):1491-4. doi: 10.3109/14767058.2014.958462.

Wastyk, H.C., Fragiadakis, G.K., Perelman, D., Dahan, D., Merrill, B.D., Yu, F.B., Topf, M., Gonzalez, C.G., Van Treuren, W., Han, S., Robinson, J.L., Elias, J.E., Sonnenburg, E.D., Gardner, C.D., and Sonnenburg, J.L., 2021. Gut-microbiota-targeted diets modulate human immune status. Cell 184(16):4137-4153.e14. doi: 10.1016/j.cell.2021.06.019.

Yao, S., Wang, P., Bai, F., Yu, X., Cao, Y., Cheng, K., Ge, Y., Xin, D., Zhang, T., Liu, Y., Cai, C., and Cheng, C, 2021. Research on the inventory of microbial food cultures in Chinese traditional fermented foods (2nd edition) Food and Fermentation Industries:1-30[2021-10-02]. https://doi.org/10.13995/j.cnki.11-1802/ts.029332

Zarzecka, U., Zadernowska, A., and Chajęcka-Wierzchowska, W., 2020. Starter cultures as a reservoir of antibiotic resistant microorganisms. LWT Food Science and Technology 127, 109424

Zheng, J., Wittouck, S., Salvetti, E., Franz, C.M.A.P., Harris, H.M.B., Mattarelli, P., O'Toole, P.W., Pot, B., Vandamme, P., Walter, J., Watanabe, K., Wuyts, S., Felis, G.E., Gänzle, M.G., and Lebeer, S., 2020. A taxonomic note on the genus *Lactobacillus*: Description of 23 novel genera, emended description of the genus *Lactobacillus* Beijerinck 1901, and union of *Lactobacillaceae* and *Leuconostocaceae*. International Journal of Systematic and Evolutionary Microbiology 70(4):2782-2858. doi: 10.1099/ijsem.0.004107. Epub 2020 Apr 15. PMID: 32293557

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Appendix – Case reports Opportunistic Infections – *Lactobacillus* genus

Academic Year 2020/2021

GENRE	Organism	Identification	Clinical Diagnosis	SEPSIS	Sexe	Age (NUM)	Pays	Details (Risk Factor & Predisposing causes, Source of isolation)	Immunostatus	RISK FACTOR	Antibiotherapy : 1st Line	Antibiotherapy : 2nd Line	Outcome	Reference
Lactobacillus	*L. paracasei*	Microbiological phenotype	Endocarditis	Endocarditis	Female	18	Germany	Atrioventricular septal defect.Antibiotic treatment, pulmonary hypertension.	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Schmidt et al., 2001
Lactobacillus	*L. rhamnosus*	API (API50CHL)	Bacteraemia	Bacteraemia / Septicaemia	Male	65	Greece	Admitted with a low-grade fever, fatigue, arthralgias and night sweats of 1 months duration. Ten days before onset of symptoms he underwent an unrevealing clonoscopy due to chronic constipation. The patient reported heavy daily consumption of dairy products. A transthoracic cardiac echocardiogram 1 year before admission was normal. A transthoracis echocardiogram revealed three vegetations on the aortic valve, and mild aortic regurgitation. Three consecutive blood cultures gave L. rhamnosus. Treatlment with intravenous penicllin (24 million units per day) and gentamicin (80 mg every 8 h) was ineffective. Treatment changed to intravenous ceftriaxone (2 g per day), clindamycin (800 mg every 8 h) and ciprofloxacin (400 mg every 12 h), which proved effective.No recent manipulation.	Competent	Wound and/or Invasive procedure			Cured	Avlami et al., 2001
Lactobacillus	*L. rhamnosus*	API (API 50 CH)	Ulcerative colitis	Metabolism Disorder	Female	44	Italy	Not stated.	Not stated.	Not stated.			Cured	Farina et al., 2001
Lactobacillus	*L. curvatus*	Not specified	Endocarditis	Endocarditis	Male	72	United Kingdom	Heart murmur in its 40's. dental operation five months before	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Mitchell et al. 1999
Lactobacillus	*L. rhamnosus*	Microbiological phenotype	Fever, bacteraemia	Bacteraemia / Septicaemia	Female	5	France	AIDS, antibiotic treatment for purulent rhinitis with fever.	Compromized	Immunodeficiency			Cured	Schlegel et al., 1998
Lactobacillus	*L. jensenii*	Not specified	Endocarditis	Endocarditis	Female	80	United States	Valvular heart disease.poorly maintained dentition.	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Vaghjimal et al., 1997
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Endocarditis	Endocarditis	Female	28	France	Mitral valve prolapse. Celioscopic appendectomy	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Bessis et al., 1995
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Endocarditis	Endocarditis	Female	21	United States	Ventricular septal defect.Broken molar 1 month prior. Teeth with multiple caries.	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Puleo et al., 1994
Lactobacillus	*L. casei*	Not specified	Endocarditis	Endocarditis	Male	24	Italy	Inravenous heroin drug addict. Valve replacement	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Verani et al. 1993
Lactobacillus	*L. paracasei*	API (API50CHL) - Harty 1993	Endocarditis	Endocarditis	Male	41	Korea	Previous episode of subacute bacterial endocarditis (a-haemolytic Streptococcus).Dental procedure 3 months prior	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Chong et al., 1991
Lactobacillus	*L. jensenii*	ID by Miscellaneous Identification Unit, CPHL	Endocarditis	Endocarditis	Male	61	United Kingdom	Prosthetic AV. Prior endocarditis (S. faecalis).Severe periodontal disease	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Atkins et al., 1990
Lactobacillus	*L. plantarum*	Microbiological phenotype	Endocarditis	Endocarditis	Male	69	Sweden	Prior endocarditis (Streptococcus).Dental work. Benign monoclonal gammopathy	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Struve et al., 1988
Lactobacillus	*L. acidophilus*	DNA sequences	Endocarditis	Endocarditis	Female	26	Japan	Operation of Fallot's tetralogy 16 years prior (heart surgery).Abortion	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Unoki et al., 1988
Lactobacillus	*L. rhamnosus*	Gas liquid chromatography	Endocarditis	Endocarditis	Male	66	South Africa	Myocardial infarction. Dental procedure	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Death	Naude et al., 1988
Lactobacillus	*L. plantarum*	Microbiological phenotype	Endocarditis	Endocarditis	Male	66	United Kingdom	Mitral insufficiency. Left ventricular hypertrophy.	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Death	Thangkhiew and Gunstone, 1988
Lactobacillus	*Lactobacillus spp.*	Not specified	Endocarditis	Endocarditis	Male	42	New Zealand	Rh. VD. valve replacement	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Peat et al., 1986
Lactobacillus	*L. plantarum*	Not specified	Bacteraemia	Bacteraemia / Septicaemia	Male	40	United Kingdom	Previous medical history was unremarkable. Presented with endocarditis. All six blood cultures taken on admission yielded L. plantarum. Successfully treated with penicillin and gentamicin. 10 weeks after initial presentation a very calcified and incompetent aortic valve was replaced. It is unclear whether this damage was present before infection or was as a result of the infection	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Davies et al., 1986
Lactobacillus	*L. rhamnosus*	Not specified	Endocarditis	Endocarditis	Male	55	United Kingdom	Presented with endocarditis and 4 consecutive blood cultures yielded L. rhamnosus. Treated with penicillin, then gentamicin added to treatment. This was then changed to amoxycillin and rifampicin. Several weeks after discharge he was readmitted and the aortic and mitral valves were replaced, the aortic valve having shown signs of infection	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Davies et al., 1986
Lactobacillus	*L. plantarum*	Microbiological phenotype	Endocarditis	Endocarditis	Male	30	Israël	Rh. VD (MV + AV). Aortic insufficiency.Dental work. valve replacement	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Shinar et al., 1984
Lactobacillus	*L. plantarum*	Microbiological phenotype	Endocarditis	Endocarditis	Male	74	Belgium	Obstructive cardiomyopathy.Periodontal infection	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Zech et al., 1983
Lactobacillus	*Lactobacillus spp.*	Not specified	Allograft pyelonephritis and bacteraemia	Bacteraemia / Septicaemia	Female	55	United States	Diabetes mellitus, 6 years before had undergone a renal transplantation – problems with rejection.	Compromized	Diabetes mellitus			Cured	Jones et al., 2000
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Dental abscess. Septic arthritis	Abscess	Male	5	United States	Not stated.	Not stated.	Not stated.			Cured	Bayer et al., 1978
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Posterior cul-de-sac abscess and pelvic peritonitis	Abscess	Female	47	United States	Cancer of the ovary with large bowel disease.	Compromized	Immunodeficiency			Cured	Bayer et al., 1978
Lactobacillus	*L. casei*	Microbiological phenotype	Endocarditis of aortic valve	Endocarditis	Male	43	United States	Carious teeth. Heroin addiction. Diabetes mellitus. Bicuspid aortic valve.	Compromized	Diabetes mellitus			Cured	Bayer et al., 1978
Lactobacillus	*L. leichmanii*	Microbiological phenotype	Perforated appendix with peritonitis	Abscess	Male	48	United States	Not stated.	Not stated.	Not stated.			Cured	Bayer et al., 1978
Lactobacillus	*L. plantarum*	Microbiological phenotype	Endocarditis of prosthetic aortic valve	Endocarditis	Female	48	United States	Cardiomyopathy; Starr Edwards prosthetic aortic valve	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Death	Bayer et al., 1978
Lactobacillus	*L. plantarum*	Microbiological phenotype	Endocarditis of aortic valve	Endocarditis	Male	52	United States	Heroin addiction. Previous endocarditis with group D *Streptococccus*, carious teeth	Compromized	Central Venous Catheter / Mitral Valve / Prior endocarditis			Death	Bayer et al., 1978
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Endometris	Abscess	Female	22	United States	Pregnancy. Pre eclampsia.	Compromized	Immunodeficiency			Cured	Bayer et al., 1978
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Peri-omphalitis	Abscess	Female	0	United States	Prematurity, hyaline membrane disease	Compromized	Immunodeficiency			Cured	Bayer et al., 1978
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Endometris	Abscess	Female	24	United States	Pregnancy. Pre eclampsia.	Compromized	Immunodeficiency			Cured	Bayer et al., 1978
Lactobacillus	*L. casei*	Not specified	Endocarditis	Endocarditis	Male	33	France	Aortic insufficiency. Dental extractions	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Dupont and Lapresle, 1977
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Endocarditis	Endocarditis	Male	40	United States	Not stated.	Not stated.	Not stated.			Cured	Rubenfeld and Min, 1977
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Endocarditis	Endocarditis	Male	50	United Kingdom	Rh. VD (MV). Prior endocarditis (S. viridans).Poor dentition. Extractions	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Isenberg, 1977
Lactobacillus	*L. casei*	Not specified	Endocarditis	Endocarditis	Male	63	United States	Severely decayed teeth	Competent	Dental work			Cured	Tenenbaum and Warner, 1975
Lactobacillus	*L. rhamnosus*	Microbiological phenotype	Endocarditis	Endocarditis	Female	6	Germany	Transposition of great vessels.Sepsis post-tooth extraction	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Fritsche et al., 1973
Lactobacillus	*L. plantarum*	Microbiological phenotype	Septicaemia	Bacteraemia / Septicaemia	Male	64	United Kingdom	Adeno carcinoma of stomach	Compromized	Immunodeficiency			Cured	Sharpe et al., 1973
Lactobacillus	*L. rhamnosus*	Microbiological phenotype	Endocarditis	Endocarditis	Male	31	United Kingdom	Rheumatic valvular disease	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Sharpe et al., 1973

GENRE	Organism	Identification	Clinical Diagnosis	SEPSIS	Sexe	Age (NUM)	Pays	Details (Risk Factor & Predisposing causes, Source of isolation)	Immunostatus	RISK FACTOR	Antibiotherapy : 1st Line	Antibiotherapy : 2nd Line	Outcome	Reference
Lactobacillus	*L. rhamnosus*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	32	United Kingdom	Erysipeloid condition	Competent	Polymicrobial Infection			Death	Sharpe et al., 1973
Lactobacillus	*L. rhamnosus*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	17	United Kingdom	Dental extraction. Congenital heart disease. Marfan's syndrome, rheumatic fever	Competent	Dental work			Cured	Sharpe et al., 1973
Lactobacillus	*L. rhamnosus*	Microbiological phenotype	Endocarditis	Endocarditis	Female	36	United Kingdom	History of coarction of the aorta	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Sharpe et al., 1973
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Meningitis. Septicaemia	Bacteraemia / Septicaemia	Not specified	0	United Kingdom	Not stated.	Not stated.	Not stated.			Death	Sharpe et al., 1973
Lactobacillus	*L. plantarum*	Microbiological phenotype	Endocarditis	Endocarditis	Female	44	United States	None.Dental Scraping, Many carious teeth	Competent	Dental work			Cured	Axlerod et al. 1973
Lactobacillus	*Lactobacillus spp.*	Not specified	Endocarditis	Endocarditis	Female	34	France	Rh. VD.Parturition, Mitral stenosis surgery during pregnancy	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Horeau et al., 1969
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Chondritis	Organ failure	Female	16	United States	Ear piercing. Diabetes	Compromized	Diabetes mellitus			Cured	Razavi and Schilling, 2000
Lactobacillus	*Lactobacillus spp.*	Not specified	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Treatment for oesophageal dilation.	Competent	Wound and/or Invasive procedure			Cured	Hirota et al., 1999
Lactobacillus	*Lactobacillus spp.*	Not specified	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Treatment for oesophageal dilation.	Competent	Wound and/or Invasive procedure			Cured	Hirota et al., 1999
Lactobacillus	*L. rhamnosus GG*	API (API50CHL), Mass Spectro	Liver abscess	Abscess	Female	74	Finland	Hypertension, diabetes mellitus, 74 years old, drinking 500 ml of dairy probiotics per day.	Compromized	Diabetes mellitus			Cured	Rautio et al., 1999
Lactobacillus	*L. casei*	API, Vitek	Abdominal wall abscess	Abscess	Female	36	Taïwan	7 years before, she underwent surgery for a perforated peptic ulcer and suffered complications.	Competent	Wound and/or Invasive procedure			Cured	Lu et al., 1999
Lactobacillus	*L. curvatus*	Not specified	Salpingitis	Organ failure	Female	Not specified		Not stated.	Not stated.	Not stated.			Not specified	Kirjavainen et al., 1999
Lactobacillus	*L. paracasei*	Not specified	Not specified	Not specified	Not specified	Not specified		Not stated.	Not stated.	Not stated.			Death	Kirjavainen et al., 1999
Lactobacillus	*L. paracasei*	Not specified	Respiratory infection	Organ failure	Not specified	Not specified		Kidney transplant recipient.	Compromized	Immunodeficiency			Not specified	Kirjavainen et al., 1999
Lactobacillus	*L. rhamnosus*	Not specified	Infection of aortic aneurysm graft	Endocarditis	Not specified	Not specified		Not stated.	Not stated.	Not stated.			Not specified	Kirjavainen et al., 1999
Lactobacillus	*L. rhamnosus*	Not specified	Not specified	Not specified	Not specified	Not specified		Carcinoma with liver metastasis.	Compromized	Immunodeficiency			Not specified	Kirjavainen et al., 1999
Lactobacillus	*L. rhamnosus*	Not specified	Not specified	Not specified	Not specified	Not specified		Fever of unknown origin, urinary complaints.	Not stated.	Not stated.			Not specified	Kirjavainen et al., 1999
Lactobacillus	*Lactobacillus spp.*	Not specified	Pneumonia	Organ failure	Not specified	Not specified		Liver transplant recipient.	Compromized	Immunodeficiency			Not specified	Kirjavainen et al., 1999
Lactobacillus	*L. casei*	Not specified	Pneumonia	Organ failure	Male	44	Italy	Intravenous drug user, AIDS.	Compromized	Immunodeficiency			Cured	Rogasi et al., 1998
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Chorioamnionitis and neonatal infection	Organ failure	Female	27	United States	Pregnancy	Compromized	Immunodeficiency			Cured	Lorenz et al., 1982
Lactobacillus	*L. casei*	Microbiological phenotype	Endocarditis	Endocarditis	Female	35	Spain	Presented with fever (39°C), weakness and recent loss of weight (4 kg). The patient had a systolic murmur and two painful erythmatic lesions on the hands. Apart from that the patient was in good health. Blood culture yielded a monoculture of L. casei, resistant to vancomycin. An ecocardiogram showed that an aortic bicuspid valve had a vegetation and an abscess 6 mm in diameter was also noted on the aortic wall. Antibiotic treatment was initiated consisting of 4,000,000U/4 h of penicillin G, and 1mg/kg/8h gentamycin (i.v.). After 2 weeks of treatment, due to the persistence of the abscess, it was necessary to replace the valve.4 extractions some months before	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Ruiz et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Male	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Male	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Male	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Male	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Male	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Male	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Male	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Male	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Male	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Female	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Female	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Female	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Female	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Female	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Female	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Female	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Female	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Female	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Female	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Female	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Female	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Female	Not specified	United States	Cancer patients.	Compromized	Immunodeficiency			Not specified	Cooper et al., 1998
Lactobacillus	*L. casei*	Microbiological phenotype	Infection of abdominal aortic graft	Endocarditis	Male	65	Netherlands	Abnormal tricuspid valve, chronic obstructive pulmonary disease and carotic artery obstruction.	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Schoon et al., 1998
Lactobacillus	*L. acidophilus*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	65	United States	Esophagal cancer	Compromized	Immunodeficiency			Death	Husni et al., 1997
Lactobacillus	*L. casei*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	56	United States	Sarcoidosis	Compromized	Immunodeficiency			Cured	Husni et al., 1997
Lactobacillus	*L. casei*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Female	66	United States	Common bile duct carcinoma	Compromized	Immunodeficiency			Cured	Husni et al., 1997
Lactobacillus	*L. casei*	BACTEC	Intraabdominal abscess	Abscess	Male	67	United States	Alcohol abuse, Liver cirrhosis	Compromized	Immunodeficiency			Death	Husni et al., 1997
Lactobacillus	*L. casei*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Female	48	United States	Chronic active hepatitis	Compromized	Immunodeficiency			Death	Husni et al., 1997
Lactobacillus	*L. casei*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	66	United States	Valvular disease	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Husni et al., 1997
Lactobacillus	*L. casei*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	59	United States	Rectosigmoid cancer	Compromized	Immunodeficiency			Cured	Husni et al., 1997
Lactobacillus	*L. casei*	BACTEC	Endocarditis	Endocarditis	Female	52	United States	CVA, seizure	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Husni et al., 1997
Lactobacillus	*L. casei*	BACTEC	Endovascular infection	Endocarditis	Male	57	United States	Pancreatitis	Compromized	Immunodeficiency			Cured	Husni et al., 1997
Lactobacillus	*L. casei*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	42	United States	Knee surgery for streptococcal arthritis	Competent	Wound and/or Invasive procedure			Cured	Husni et al., 1997
Lactobacillus	*L. casei*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Female	37	United States	Cardiac transplant, Diabetes mellitus	Compromized	Diabetes mellitus			Cured	Husni et al., 1997
Lactobacillus	*L. leichmanii*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	81	United States	metastatic cancer	Compromized	Immunodeficiency			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Female	46	United States	Lung transplantation, Pulmonary fibrosis	Compromized	Immunodeficiency			Cured	Husni et al., 1997

GENRE	Organism	Identification	Clinical Diagnosis	SEPSIS	Sexe	Age (NUM)	Pays	Details (Risk Factor & Predisposing causes, Source of isolation)	Immunostatus	RISK FACTOR	Antibiotherapy : 1st Line	Antibiotherapy : 2nd Line	Outcome	Reference
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Female	70	United States	CABG, CRF, Clostridium difficile colitis	Competent	Polymicrobial Infection			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Female	64	United States	Diabetes mellitus	Compromized	Diabetes mellitus			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	72	United States	Diabetes mellitus	Compromized	Diabetes mellitus			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	57	United States	Diabetes mellitus	Compromized	Diabetes mellitus			Death	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Female	26	United States	Factitious disease	Not stated.	Not stated.			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Intraabdominal abscess	Abscess	Female	69	United States	CVA, seizure	Competent	Wound and/or Invasive procedure			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	52	United States	Laryngeal cancer	Compromized	Immunodeficiency			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Female	67	United States	Diabetes mellitus	Compromized	Diabetes mellitus			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	74	United States	Pancreatitis, pyelonephritis	Compromized	Immunodeficiency			Death	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	65	United States	Renal cell cancer	Compromized	Immunodeficiency			Death	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Perinephric abscess	Abscess	Female	81	United States	Diabete mellitus	Compromized	Diabetes mellitus			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	74	United States	Gastric cancer	Compromized	Immunodeficiency			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	59	United States	Diffuse artherosclerosis	Competent	Metabolism disorder / Organ failure			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	35	United States	NHL	Not stated.	Not stated.			Death	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	52	United States	Rectal carcinoma	Compromized	Immunodeficiency			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Female	71	United States	Borad spectrum ABT, ischemic bowel	Competent	Metabolism disorder / Organ failure			Death	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Female	79	United States	Diabete mellitus	Compromized	Diabetes mellitus			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Female	69	United States	Sudden cardiopulmonary arrest, Diabetes mellitus, urinary tract infection	Compromized	Diabetes mellitus			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	73	United States	Prostate cancer, diabetes mellitus	Compromized	Diabetes mellitus			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Female	71	United States	Pneumonia.	Compromized	Immunodeficiency			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	70	United States	Bladder cancer, stenosis of ilial conduct	Compromized	Immunodeficiency			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Female	47	United States	Marfan's syndrome, pneumonia	Competent	Metabolism disorder / Organ failure			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	84	United States	Diabetes mellitus	Compromized	Diabetes mellitus			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Female	45	United States	Diabetes mellitus, pancreatitis	Compromized	Diabetes mellitus			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	36	United States	Lung transplant, diabetes mellitus	Compromized	Diabetes mellitus			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	66	United States	Carcinoid, recent endocscopy	Competent	Wound and/or Invasive procedure			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	66	United States	Rheumatic heart disease, tricuspid valve repair	Competent	Wound and/or Invasive procedure			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Female	79	United States	occult metastatic adenocarcinoma	Compromized	Immunodeficiency			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Female	74	United States	diabetes mellitus, endometrial cancer	Compromized	Diabetes mellitus			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	62	United States	Esophagal carcinoma, alcohol abuse, pulmonary embolus	Compromized	Immunodeficiency			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Female	64	United States	Breast cancer, post chemotherapy	Compromized	Immunodeficiency			Cured	Husni et al., 1997
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Female	46	United States	Urinary tract infection, Marfan's syndrome, abdominal aneurysm repair, broad spectrum ABT	Competent	Metabolism disorder / Organ failure			Cured	Husni et al., 1997
Lactobacillus	*L. paracasei*	Not specified	Septicaemia	Bacteraemia / Septicaemia	Male	63	France	Neutropenia. Acute leukemia	Compromized	Immunodeficiency			Cured	Fruchart et al., 1997
Lactobacillus	*L. rhamnosus*	Not specified	Septicaemia	Bacteraemia / Septicaemia	Male	22	France	Neutropenia. Acute leukemia	Compromized	Immunodeficiency			Cured	Fruchart et al., 1997
Lactobacillus	*L. rhamnosus*	Not specified	Pneumonia	Organ failure	Male	54	France	Neutropenia. Acute leukemia	Compromized	Immunodeficiency			Cured	Fruchart et al., 1997
Lactobacillus	*L. rhamnosus*	Not specified	Septicaemia	Bacteraemia / Septicaemia	Male	49	France	Neutropenia. Acute leukemia	Compromized	Immunodeficiency			Cured	Fruchart et al., 1997
Lactobacillus	*L. rhamnosus*	ID by public health reference Lab (IP Paris)	Pneumonia	Organ failure	Female	38	France	AIDS, history of oesophageal candidiasis and pulmonary pneumocystosis, tuberculosis. Antibiotics given for staphylococcal infection.	Compromized	Immunodeficiency			Death	Abgrall et al., 1997
Lactobacillus	*Lactobacillus spp.*	ID by Tennesse department of public health reference laboratory	Pancytopenia, fever, hypotension	Bacteraemia / Septicaemia	Male	54	United States	Acute leukaemia.	Compromized	Immunodeficiency			Cured	Antony et al., 1996
Lactobacillus	*Lactobacillus spp.*	ID by Tennesse department of public health reference laboratory	Chest pain, fever, hypotension, multiple caries	Abscess	Female	72	United States	Coronary artery disease.	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Death	Antony et al., 1996
Lactobacillus	*Lactobacillus spp.*	ID by Tennesse department of public health reference laboratory	Fever, interstitial infiltrates	Bacteraemia / Septicaemia	Male	60	United States	Acute myocardial infarction, hypertension.	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Antony et al., 1996
Lactobacillus	*Lactobacillus spp.*	ID by Tennesse department of public health reference laboratory	Fever, pleuritic pain, carious teeth, right infiltrate, hypotension	Bacteraemia / Septicaemia	Female	80	United States	Chronic obstructive pulmonary disease, diabetes mellitus, renal failure.	Compromized	Diabetes mellitus			Cured	Antony et al., 1996
Lactobacillus	*Lactobacillus spp.*	ID by Tennesse department of public health reference laboratory	Fever, productive cough, malaise, diarrhoea	Bacteraemia / Septicaemia	Female	57	United States	Heart transplant.	Compromized	Immunodeficiency			Cured	Antony et al., 1996
Lactobacillus	*Lactobacillus spp.*	ID by Tennesse department of public health reference laboratory	Fever, urosepsis	Bacteraemia / Septicaemia	Female	89	United States	Stroke ,dementia.	Competent	Metabolism disorder / Organ failure			Cured	Antony et al., 1996
Lactobacillus	*Lactobacillus spp.*	ID by Tennesse department of public health reference laboratory	Fever, sepsis, pneumonia, hypotension	Bacteraemia / Septicaemia	Male	74	United States	Coronary bypass graft, hypertension.	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Antony et al., 1996
Lactobacillus	*Lactobacillus spp.*	ID by Tennesse department of public health reference laboratory	Fever, urosepsis, hypotension	Bacteraemia / Septicaemia	Female	90	United States	Hypertension, osteoarthritis.	Compromized	Immunodeficiency			Cured	Antony et al., 1996
Lactobacillus	*Lactobacillus spp.*	ID by Tennesse department of public health reference laboratory	Congestive heart failure, arterial fibrillation, fever	Endocarditis	Female	78	United States	Diabetes mellitus, Bell's palsy.	Compromized	Diabetes mellitus			Cured	Antony et al., 1996
Lactobacillus	*Lactobacillus spp.*	ID by Tennesse department of public health reference laboratory	Fever, urosepsis	Bacteraemia / Septicaemia	Female	67	United States	Hypertension, diabetes mellitus.	Compromized	Diabetes mellitus			Cured	Antony et al., 1996
Lactobacillus	*Lactobacillus spp.*	ID by Tennesse department of public health reference laboratory	Fever, pneumonia	Bacteraemia / Septicaemia	Male	63	United States	Hypertension.	Compromized	Immunodeficiency			Death	Antony et al., 1996

GENRE	Organism	Identification	Clinical Diagnosis	SEPSIS	Sexe	Age (NUM)	Pays	Details (Risk Factor & Predisposing causes, Source of isolation)	Immunostatus	RISK FACTOR	Antibiotherapy : 1st Line	Antibiotherapy : 2nd Line	Outcome	Reference
Lactobacillus	*Lactobacillus spp.*	ID by Tennesse department of public health reference laboratory	Fever, vomiting	Bacteraemia / Septicaemia	Male	52	United States	Umbilical hernia.	Competent	Metabolism disorder / Organ failure			Death	Antony et al., 1996
Lactobacillus	*L. casei*	16S RNA sequence clustering	Infection of abdominal aortic graft	Endocarditis	Male	78	Finland	Not stated.	Not stated.	Not stated.			Cured	Saxelin et al. 1996
Lactobacillus	*L. casei*	16S RNA sequence clustering	Salpingitis	Organ failure	Female	33	Finland	Not stated.	Not stated.	Not stated.			Cured	Saxelin et al. 1996
Lactobacillus	*L. fermentum*	16S RNA sequence clustering	Pneumonia	Organ failure	Male	55	Finland	Liver transplant recipient.	Compromized	Immunodeficiency			Cured	Saxelin et al. 1996
Lactobacillus	*L. paracasei*	16S RNA sequence clustering	Not specified	Not specified	Male	59	Finland	Not stated.	Not stated.	Not stated.			Death	Saxelin et al. 1996
Lactobacillus	*L. paracasei*	16S RNA sequence clustering	Respiratory infection	Organ failure	Male	57	Finland	Kidney transplant recipient.	Compromized	Immunodeficiency			Cured	Saxelin et al. 1996
Lactobacillus	*L. rhamnosus*	16S RNA sequence clustering	Infection of aortic aneurysm graft	Endocarditis	Male	76	Finland	Not stated.	Not stated.	Not stated.			Cured	Saxelin et al. 1996
Lactobacillus	*L. rhamnosus*	16S RNA sequence clustering	Carcinoma with liver metastatis	Organ failure	Male	63	Finland	Not stated.	Not stated.	Not stated.			Death	Saxelin et al. 1996
Lactobacillus	*L. rhamnosus*	16S RNA sequence clustering	Fever, urinary complaints	Bacteraemia / Septicaemia	Male	70	Finland	Not stated.	Not stated.	Not stated.			Cured	Saxelin et al. 1996
Lactobacillus	*L. acidophilus*	Not specified	Liver abscess	Abscess	Male	39	France	Endocrine and exocrine insufficiency.	Competent	Metabolism disorder / Organ failure			Cured	Larvol et al., 1996
Lactobacillus	*L. rhamnosus*	API (API20 strep)	Septicaemia	Bacteraemia / Septicaemia	Male	5	United Kingdom	2 year history of severe aplastic anaemia. Received bone marrow transplant, then spent 9 months extremely immunosupressed suffering graft vs host disease. Followed by total parenteral nutrition. He then developed a febrile episode due to Hickman line sepsis (type of intubation). Identified as Enterococcus avium. This was treated with antibiotics (ceftazidime and vancomycin, then changed to ampicilin alone, then ciprofloxacin and amphotericin B). He was found to have a small pericardial effusion. After this treatment he had a further febrile episode and antibiotic treatment (ceftazimide, vancomycin and amphotericin B). Blood cultures revealed coagulase negative Staphylococcus and L. rhamnosus. During this episode cardiac failure developed. Within a few days of recovering he then developed pyrexia and died. L. rhamnosus was isolated from the pericardial fluid.Not reported	Compromized	Immunodeficiency	ceftazidime and vancomycin	Ampicilin alone, then ciprofloxacin and amphotericin B	Death	Kalima et al., 1996
Lactobacillus	*L. rhamnosus*	Microbiological phenotype	Endocarditis	Endocarditis	Male	29	Argentin	Prolapse of the mitral valve, replacement of valve immediately prior to endocarditis.	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Monterisi et al., 1996
Lactobacillus	*L. rhamnosus*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	44	United States	AIDS. No recent dental manipulation.	Compromized	Immunodeficiency			Cured	Horwitch et al., 1995
Lactobacillus	*L. rhamnosus*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	33	United States	AIDS. Groshong catheter and subsequent vancomycin treatment for a staphylococcal infection. Gastric cytomegalovirus infection, Intestinal crytosporidiosis and cutaneous Kaposi's sarcoma. (Staphylococcus spp. Torulopsis glabrata)	Compromized	Immunodeficiency			Cured	Horwitch et al., 1995
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	33	United States	AIDS. Oesophageal candidiasis, gastric Kaposi's sarcoma, Groshong catheter, chemotherapy. (Staphylococcus spp. Candida krusei)	Compromized	Immunodeficiency			Cured	Horwitch et al., 1995
Lactobacillus	*L. fermentum*	API & Vitek	Endocarditis	Endocarditis	Female	16	United States	Mitral valve cleft and insufficient.Penicillin prophylaxis and dental work	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Gallemore et al., 1995
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Early infective Endocarditis and Mediastinitis	Endocarditis	Male	54	United States	Heart transplant.E. cloacae also isolated	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Toporoff et al., 1994
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	44	United States	Primary sclerosing cholangitis	Compromized	Immunodeficiency			Cured	Patel et al. 1994
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	33	United States	Primary sclerosing cholangitis	Compromized	Immunodeficiency			Cured	Patel et al. 1994
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	55	United States	Alcoholic cirrhosis	Compromized	Immunodeficiency			Cured	Patel et al. 1994
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	59	United States	Primary sclerosing cholangitis	Compromized	Immunodeficiency			Cured	Patel et al. 1994
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	46	United States	Primary hyperoxaluria	Competent	Metabolism disorder / Organ failure			Cured	Patel et al. 1994
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	29	United States	Primary sclerosing cholangitis	Compromized	Immunodeficiency			Death	Patel et al. 1994
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	71	United States	Primary sclerosing cholangitis	Compromized	Immunodeficiency			Cured	Patel et al. 1994
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	37	United States	Primary sclerosing cholangitis	Compromized	Immunodeficiency			Cured	Patel et al. 1994
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Lactobacillus	*L. catenaforme*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Lactobacillus	*L. fermentum*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Lactobacillus	*L. jensenii*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Lactobacillus	*L. minutus*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Lactobacillus	*L. rhamnosus*	Microbiological phenotype	Intra-abdominal abscess	Abscess	Male	79	United Kingdom	Rectal polyp excision 6 months prior.	Compromized	Wound and/or Invasive procedure			Cured	Sloss and Cumberland, 1993
Lactobacillus	*L. acidophilus*	Not specified	Endocarditis	Endocarditis	Male	31	United States	Bicuspid AV. Prior endocarditis.	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Griffiths et al., 1992
Lactobacillus	*L. rhamnosus*	Not specified	Endocarditis	Endocarditis	Male	45	United States	Bicuspid AV.Dental work	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Griffiths et al., 1992
Lactobacillus	*L. rhamnosus*	Microbiological phenotype	Pneumonia / Lung abscess	Abscess	Male	73	United Kingdom	Longstanding heavy smoker, emphysema.	Compromized	Immunodeficiency			Death	Namnyak et al., 1992
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	27	United States	uterine fibroids an menorhagia	Competent	Metabolism disorder / Organ failure			Cured	Sacks et al. 1992
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Endocarditis	Endocarditis	Female	41	Spain	Mitral insufficiency.	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Urkijo et al., 1992
Lactobacillus	*L. plantarum*	Microbiological phenotype	Endocarditis	Endocarditis	Male	43	Germany	None.Corticosteroid therapy for vasculitis	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Death	Bär et al., 1987
Lactobacillus	*L. salicinius*	Microbiological phenotype	Endocarditis	Endocarditis	Female	10	Germany	Ventricular septal defect.Tooth extraction	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Berger et al., 1976

GENRE	Organism	Identification	Clinical Diagnosis	SEPSIS	Sexe	Age (NUM)	Pays	Details (Risk Factor & Predisposing causes, Source of isolation)	Immunostatus	RISK FACTOR	Antibiotherapy : 1st Line	Antibiotherapy : 2nd Line	Outcome	Reference
Lactobacillus	*L. casei*	Microbiological phenotype	Endocarditis	Endocarditis	Male	53	Switzerland	Prior endocarditis. AV replacement. Dental work	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Meier et al., 1981
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Endocarditis	Endocarditis	Female	70	France	Aortal prosthesis	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Death	Penot et al., 1998
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Pneumonia	Organ failure	Male	83	Switzerland	Prior endocarditis (S. viridans). Hypertrophic subaortic stenosis.Severe paradontosis. Relapse requiring AV replace-ment	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Stulz et al., 1989
Lactobacillus	*L. casei*	Not specified	Endocarditis	Endocarditis	Male	27	United States	Porcine prosthetic AV after S. viridans endocarditis.Multiple carious teeth Dental work. History of i.v. drug abuse. Relapsed, valve replaced	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Sussman et al., 1986
Lactobacillus	*L. acidophilus*	Not specified	Endocarditis	Endocarditis	Female	46	United States	Mitral valve prolapse with mitral valve insufficiency.	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Vogt and Hoffman, 1998
Lactobacillus	*L. acidophilus*	ID by RIVM, State Laboratory of Public Health	Septicaemia	Bacteraemia / Septicaemia	Female	26	Netherlands	Choriocarcinoma, chemotherapy.	Compromized	Immunodeficiency			Cured	Andriessen et al., 1991
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	78	United States	Partial gastrectomy	Competent	Wound and/or Invasive procedure			Cured	Baltch et al. 1977
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	56	United States	Partial gastrectomy	Competent	Wound and/or Invasive procedure			Cured	Baltch et al. 1977
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Colitis	Metabolism Disorder	Female	47	United States	Fever	Not stated.	Not stated.			Death	Bourne et al., 1978
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Peritonitis	Abscess	Female	71	United States	Fever	Not stated.	Not stated.			Death	Bourne et al., 1978
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Subacute bacterial endocarditis	Endocarditis	Female	53	United States	Subacute bacterial endocarditis	Not stated.	Not stated.			Cured	Bourne et al., 1978
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Fever 1 day post thyroidectomy	Bacteraemia / Septicaemia	Female	50	United States	Fever 1 day post thyroidectomy	Not stated.	Wound and/or Invasive procedure			Cured	Bourne et al., 1978
Lactobacillus	*L. rhamnosus*	API (API50CHL)	Pneumonia	Organ failure	Not specified	Not specified	France	Prolonged chemotherapy-induced neutropenia, acute leukaemia, pneumonia.	Compromized	Immunodeficiency			Cured	Chomarat and Espinouse, 1991
Lactobacillus	*L. rhamnosus*	API (API50CHL)	Concomitant papular, non piritic, reddish skin rash	Abscess	Not specified	Not specified	France	Prolonged chemotherapy-induced neutropenia, acute leukaemia, dermatitis.	Compromized	Immunodeficiency			Cured	Chomarat and Espinouse, 1991
Lactobacillus	*L. rhamnosus*	API (API50CHL)	Concomitant papular, non piritic, reddish skin rash	Abscess	Not specified	h	France	Prolonged chemotherapy-induced neutropenia, acute leukaemia, dermatitis.	Compromized	Immunodeficiency			Cured	Chomarat and Espinouse, 1991
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	18	United States	Developped chlorioamnionitis and postpartum endometritis	Compromized	Wound and/or Invasive procedure			Cured	Cox et al., 1986
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	22	United States	Developped chlorioamnionitis and postpartum endometritis	Compromized	Wound and/or Invasive procedure			Cured	Cox et al., 1986
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	31	United States	Developped chlorioamnionitis and postpartum endometritis	Compromized	Wound and/or Invasive procedure			Cured	Cox et al., 1986
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	24	United States	Developped chlorioamnionitis and postpartum endometritis	Compromized	Wound and/or Invasive procedure			Cured	Cox et al., 1986
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	0	United States	New born with infected mothers (see entry above).	Compromized	Immunodeficiency			Cured	Cox et al., 1986
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	0	United States	New born with infected mothers (see entry above).	Compromized	Immunodeficiency			Cured	Cox et al., 1986
Lactobacillus	*L. gasseri*	Microbiological phenotype	Urosepsis	Organ failure	Male	66	Germany	Obstructive renal lothiasis, diabetes, renal stasis.	Compromized	Diabetes mellitus			Cured	Dickgiesser et al., 1984
Lactobacillus	*Lactobacillus spp.*	Not specified	Bacteraemia, parenchymal abscesses	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Previous pyonephritis. Pyonephrolithiasis.	Compromized	Immunodeficiency			Cured	Manzella and Harootunian, 1982
Lactobacillus	*L. rhamnosus*	Microbiological phenotype	Peritonitis	Abscess	Male	59	United Kingdom	Chronic renal failure. CAPD., Repeated courses of vancomycin.	Competent	Wound and/or Invasive procedure			Cured	Sanyal and Bhandari, 1992
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Splenic abscess	Abscess	Male	79	Spain	Multiple carious teeth	Competent	Dental work			Cured	Saez-Roca et al. 1998
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Not specified	Not specified	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Not specified	Ruoff et al., 1988
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Not specified	Not specified	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Not specified	Ruoff et al., 1988
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Hepatic abscess	Abscess	Female	45	United States	Not stated.	Not stated.	Not stated.			Death	Ruoff et al., 1988
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Intra-abdominal abscess	Abscess	Male	63	United States	Not stated.	Not stated.	Not stated.			Cured	Ruoff et al., 1988
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	41	United States	Not stated.	Not stated.	Not stated.			Cured	Ruoff et al., 1988
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Gastrostomy site	Abscess	Female	69	United States	Not stated.	Not stated.	Not stated.			Death	Ruoff et al., 1988
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Enterocutaneous fistula	Abscess	Male	46	United States	Not stated.	Not stated.	Not stated.			Cured	Ruoff et al., 1988
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*L. catenaforme*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*L. fermentum*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*L. fermentum*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*L. fermentum*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*L. jensenii*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*L. jensenii*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996

GENRE	Organism	Identification	Clinical Diagnosis	SEPSIS	Sexe	Age (NUM)	Pays	Details (Risk Factor & Predisposing causes, Source of isolation)	Immunostatus	RISK FACTOR	Antibiotherapy : 1st Line	Antibiotherapy : 2nd Line	Outcome	Reference
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Infections were polymicrobial in 36 patients.	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Mostly from abcesses (14 cases), pneumonia (x8)	Not stated.	Polymicrobial Infection			Cured	Brook, 1996
Lactobacillus	*L. rhamnosus*	ID by UK National Collection of Type Cultures	Gall bladder empyema	Abscess	Female	73	United Kingdom	None except stone engaged in adduct.	Competent	Metabolism disorder / Organ failure			Cured	Allison and Galloway, 1988
Lactobacillus	*L. paracasei*	Microbiological phenotype	Mycotic aneurysm	Abscess	Male	70	United Kingdom	High probability of atherosclerosis.	Competent	Metabolism disorder / Organ failure			Cured	Sturdee et al., 1998
Lactobacillus	*Lactobacillus spp.*	Not specified	Pneumonia	Organ failure	Male	52	United States	Transplanted Lung	Compromized	Immunodeficiency			Cured	Jones et al. 1994
Lactobacillus	*L. acidophilus*	Not specified	Septicaemia	Bacteraemia / Septicaemia	Male	0	United States	Preterm gestation with drug and alcohol abuse	Compromized	Immunodeficiency			Cured	Thompson et al. 2001
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Cerebral embolis.	Organ failure	Male	42	Brazil	High blood pressure with enlarged heart. Arthralgia. Enlarged spleen.	Compromized	Immunodeficiency			Death	Biocca and Reitano, 1943
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	32	Brazil	Rh.VD, Enlarged heart.Dental extractions (granulomas). Acute rheumatic fever with aortic and mitral disease.	Competent	Dental work			Death	Biocca and Seppilli, 1947
Lactobacillus	*L. acidophilus*	Not specified	Endocarditis	Endocarditis	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Not specified	Cherubin and Neu, 1971
Lactobacillus	*L. bulgaricus*	Microbiological phenotype	Septic wound	Bacteraemia / Septicaemia	Not specified	Not specified	India	Not stated.	Not stated.	Not stated.			Not specified	Chatterjee et al. 1993
Lactobacillus	*L. acidophilus*	Not specified	Septic shock	Bacteraemia / Septicaemia	Not specified	Not specified		Not stated.	Not stated.	Not stated.			Not specified	Cleva et al., 1994
Lactobacillus	*L. rhamnosus*	16S RNA sequence clustering	Endocarditis	Endocarditis	Male	23	Austria	Bicuspid aortic valve.Port of entry : Lactobacillus infection of the ankle	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Presterl et al., 2001
Lactobacillus	*L. crispatus*	API (API50 CHL)	Granulocytopenia	Bacteraemia / Septicaemia	Male	80	France	Hospitalized immunocompromised septic patient	Compromized	Immunodeficiency			Cured	Felten et al. 1999
Lactobacillus	*L. paracasei*	API (API50 CHL)	Granulocytopenia	Bacteraemia / Septicaemia	Male	34	France	Hospitalized immunocompromised septic patient	Compromized	Immunodeficiency			Cured	Felten et al. 1999
Lactobacillus	*L. rhamnosus*	API (API50 CHL)	Granulocytopenia	Bacteraemia / Septicaemia	Male	35	France	Hospitalized immunocompromised septic patient	Compromized	Immunodeficiency			Cured	Felten et al. 1999
Lactobacillus	*L. rhamnosus*	API (API50 CHL)	Granulocytopenia	Bacteraemia / Septicaemia	Male	12	France	Hospitalized immunocompromised septic patient	Compromized	Immunodeficiency			Death	Felten et al. 1999
Lactobacillus	*L. rhamnosus*	API (API50 CHL)	Granulocytopenia	Bacteraemia / Septicaemia	Female	50	France	Hospitalized immunocompromised septic patient	Compromized	Immunodeficiency			Cured	Felten et al. 1999
Lactobacillus	*L. rhamnosus*	API (API50 CHL)	Granulocytopenia	Bacteraemia / Septicaemia	Male	55	France	Hospitalized immunocompromised septic patient	Compromized	Immunodeficiency			Cured	Felten et al. 1999
Lactobacillus	*L. rhamnosus*	API (API50 CHL)	Granulocytopenia	Bacteraemia / Septicaemia	Female	11	France	Hospitalized immunocompromised septic patient	Compromized	Immunodeficiency			Cured	Felten et al. 1999
Lactobacillus	*L. rhamnosus*	API (API50 CHL)	Granulocytopenia	Bacteraemia / Septicaemia	Male	7	France	Hospitalized immunocompromised septic patient	Compromized	Immunodeficiency			Cured	Felten et al. 1999
Lactobacillus	*L. rhamnosus*	API (API50 CHL)	Granulocytopenia	Bacteraemia / Septicaemia	Male	24	France	Hospitalized immunocompromised septic patient	Compromized	Immunodeficiency			Cured	Felten et al. 1999
Lactobacillus	*L. rhamnosus*	API (API50 CHL)	Granulocytopenia	Bacteraemia / Septicaemia	Female	4	France	Hospitalized immunocompromised septic patient	Compromized	Immunodeficiency			Cured	Felten et al. 1999
Lactobacillus	*L. rhamnosus*	API (API50 CHL)	Granulocytopenia	Bacteraemia / Septicaemia	Male	9	France	Hospitalized immunocompromised septic patient	Compromized	Immunodeficiency			Cured	Felten et al. 1999
Lactobacillus	*L. rhamnosus*	API (API50 CHL)	Granulocytopenia	Bacteraemia / Septicaemia	Female	35	France	Hospitalized immunocompromised septic patient	Compromized	Immunodeficiency			Cured	Felten et al. 1999
Lactobacillus	*L. rhamnosus*	API (API50 CHL)	Granulocytopenia	Bacteraemia / Septicaemia	Male	65	France	Hospitalized immunocompromised septic patient	Compromized	Immunodeficiency			Death	Felten et al. 1999
Lactobacillus	*L. rhamnosus*	API (API50 CHL)	Granulocytopenia	Bacteraemia / Septicaemia	Male	16	France	Hospitalized immunocompromised septic patient	Compromized	Immunodeficiency			Cured	Felten et al. 1999
Lactobacillus	*L. rhamnosus*	API (API50 CHL)	Granulocytopenia	Bacteraemia / Septicaemia	Male	29	France	Hospitalized immunocompromised septic patient	Compromized	Immunodeficiency			Death	Felten et al. 1999
Lactobacillus	*L. rhamnosus*	API (API50 CHL)	Granulocytopenia	Bacteraemia / Septicaemia	Male	6	France	Hospitalized immunocompromised septic patient	Compromized	Immunodeficiency			Cured	Felten et al. 1999
Lactobacillus	*L. rhamnosus*	API (API50 CHL)	Granulocytopenia	Bacteraemia / Septicaemia	Female	2	France	Hospitalized immunocompromised septic patient	Compromized	Immunodeficiency			Cured	Felten et al. 1999
Lactobacillus	*L. rhamnosus*	API (API50 CHL)	Granulocytopenia	Bacteraemia / Septicaemia	Male	10	France	Hospitalized immunocompromised septic patient	Compromized	Immunodeficiency			Cured	Felten et al. 1999
Lactobacillus	*L. rhamnosus*	API (API50 CHL)	Granulocytopenia	Bacteraemia / Septicaemia	Male	52	France	Hospitalized immunocompromised septic patient	Compromized	Immunodeficiency			Cured	Felten et al. 1999
Lactobacillus	*L. rhamnosus*	API (API50 CHL)	Granulocytopenia	Bacteraemia / Septicaemia	Male	29	France	Hospitalized immunocompromised septic patient	Compromized	Immunodeficiency			Death	Felten et al. 1999
Lactobacillus	*L. fermentum*	Immunilogical Assay	Purulent pleurisy	Abscess	Male	54	France	Gastrectomy for cancer subphrenic abscess (E.coli-Enterococcus).	Compromized	Immunodeficiency			Death	Colloc et al., 1978
Lactobacillus	*Lactobacillus spp.*	Not specified	Bacteraemia and pyelonephritis	Bacteraemia / Septicaemia	Female	33	United States	Pregnancy	Compromized	Immunodeficiency			Cured	Digamon-Beltran et al., 1985
Lactobacillus	*Lactobacillus spp.*	Not specified	Endocarditis	Endocarditis	Male	9	Germany	Ventricular septal effect.Chronic tonsillitis	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Dietzsch, 1955
Lactobacillus	*L. rhamnosus*	Microbiological phenotype	Endocarditis	Endocarditis	Male	11	France	Congenital cyanotic heart disease.Dental abscess	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Duval et al., 1973
Lactobacillus	*L. casei*	Not specified	Endocarditis	Endocarditis	Not specified	Not specified	Australia	Not stated.	Not stated.	Not stated.			Not specified	Golledge et al. 1988
Lactobacillus	*L. jensenii*	Not specified	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Australia	Thoracic empyaema following a presumed oesophagal rupture	Competent	Wound and/or Invasive procedure			Not specified	Golledge et al. 1988
Lactobacillus	*L. rhamnosus*	Not specified	Endocarditis	Endocarditis	Not specified	Not specified	Australia	Not stated.	Not stated.	Not stated.			Not specified	Golledge et al. 1988
Lactobacillus	*L. casei*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	Not specified	France	reticulosarcoma	Compromized	Immunodeficiency			Cured	Gaborit, 1978
Lactobacillus	*L. casei*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	Not specified	France	hyperparathyroidis	Competent	Metabolism disorder / Organ failure			Death	Gaborit, 1978
Lactobacillus	*Lactobacillus spp.*	Not specified	Urinary tract infection	Organ failure	Male	70	United States	Diabetes mellitus	Compromized	Diabetes mellitus			Cured	Headington et al. 1966
Lactobacillus	*Lactobacillus spp.*	Not specified	Urinary tract infection	Organ failure	Female	36	United States	Diabetes mellitus	Compromized	Diabetes mellitus			Cured	Headington et al. 1966
Lactobacillus	*L. rhamnosus*	Not specified	Not specified	Not specified	Not specified	Not specified		Tricuspid artesia.Carious teeth	Competent	Dental work			Cured	Tornos, 1980
Lactobacillus	*L. rhamnosus*	Microbiological phenotype	Septicaemia, possible endocarditis (died before investigation could be made)	Bacteraemia / Septicaemia	Female	71	United Kingdom	Bicuspid valve replacement 2 years prior.	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Death	Holliman and Bone, 1988
Lactobacillus	*L. rhamnosus*	Microbiological phenotype	Atrioventricular graft infection	Endocarditis	Male	68	United Kingdom	Previous atrioventricular graft infections.	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Holliman and Bone, 1988
Lactobacillus	*Lactobacillus spp.*	Not specified	Isolated from lung biopsy	Organ failure	Not specified	Not specified		Not stated.	Not stated.	Not stated.			Not specified	Huygens, 1995
Lactobacillus	*Lactobacillus spp.*	Not specified	Isolated from an abscess	Abscess	Not specified	Not specified		Not stated.	Not stated.	Not stated.			Not specified	Huygens, 1995
Lactobacillus	*L. rhamnosus*	Microbiological phenotype	Peritonitis	Abscess	Male	57	Germany	CAPD, Diabetes mellitus, chronic osteomyelitus, amyloidosis of the stomach and oesophagus	Compromized	Diabetes mellitus			Cured	Klein et al. 1998
Lactobacillus	*L. acidophilus*	API (API50CHL)	Septicaemia and pyelonephritis	Bacteraemia / Septicaemia	Male	63	France	Obstructive renal lithiasis.	Compromized	Immunodeficiency			Cured	Laudat et al., 1982
Lactobacillus	*L. rhamnosus GG*	API (API50CHL), Mass Spectro	Endocarditis	Endocarditis	Male	67	United Kingdom	Mitral valve prolapse.Dental extraction (probiotic tablets)	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Mackay et al., 1999

GENRE	Organism	Identification	Clinical Diagnosis	SEPSIS	Sexe	Age (NUM)	Pays	Details (Risk Factor & Predisposing causes, Source of isolation)	Immunostatus	RISK FACTOR	Antibiotherapy : 1st Line	Antibiotherapy : 2nd Line	Outcome	Reference
Lactobacillus	*L. lactis*	Microbiological phenotype	Lung infection	Organ failure	Female	77	France	Bronchial obstruction	Competent	Metabolism disorder / Organ failure			Cured	Masure et al., 1980
Lactobacillus	*L. acidophilus*	Not specified	Black Esophagus	Abscess	Female	67	United Kingdom	Mitral valvutomy and fascia lata replacement 5 years ago	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Death	MacMannus et al. 1975
Lactobacillus	*Lactobacillus spp.*	Not specified	Urinary tract infections	Organ failure	Male	61	France	Not stated.	Not stated.	Not stated.			Cured	Pinon et al. 1981
Lactobacillus	*Lactobacillus spp.*	Not specified	Urinary tract infection	Organ failure	Not specified	Not specified	France	Not stated.	Not stated.	Not stated.			Not specified	Poty and Poty, 1979
Lactobacillus	*Lactobacillus spp.*	Not specified	Urinary tract infection	Organ failure	Not specified	Not specified	France	Not stated.	Not stated.	Not stated.			Not specified	Poty and Poty, 1979
Lactobacillus	*Lactobacillus spp.*	Not specified	Urinary tract infection	Organ failure	Not specified	Not specified	France	Not stated.	Not stated.	Not stated.			Not specified	Poty and Poty, 1979
Lactobacillus	*Lactobacillus spp.*	Not specified	Urinary tract infection	Organ failure	Not specified	Not specified	France	Not stated.	Not stated.	Not stated.			Not specified	Poty and Poty, 1979
Lactobacillus	*Lactobacillus spp.*	Not specified	Urinary tract infection	Organ failure	Not specified	Not specified	France	Not stated.	Not stated.	Not stated.			Not specified	Poty and Poty, 1979
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Pneumonia, septicaemia	Bacteraemia / Septicaemia	Male	40	Spain	Tacheo-oesophagal fistula, oesophageal carcinoma, pneumonia, smoker, heavy drinker, multiple carious teeth.	Compromized	Immunodeficiency			Death	Querol et al., 1989
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Pleural effusion, empyema	Abscess	Not specified	Not specified	Spain	Hepatic cirrhosis. Surgical procedure for oesophageal bleeding.	Compromized	Immunodeficiency			Not specified	Querol Borras et al., 1989
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Pleural empyema	Abscess	Not specified	Not specified	Spain	Oesophagus carcinoma. Pleuro-oesophagal fistula after prosthesis.	Compromized	Immunodeficiency			Not specified	Querol Borras et al., 1989
Lactobacillus	*L. rhamnosus*	Microbiological phenotype	Chest infection	Abscess	Female	61	United Kingdom	Chronic myeloid leukaemia.	Compromized	Immunodeficiency			Cured	Rahman, 1982
Lactobacillus	*L. rhamnosus*	Not specified	Peritonitis	Abscess	Male	49	United Kingdom	Continuous ambulatory peritoneal dialysis.	Competent	Wound and/or Invasive procedure			Cured	Rao et al., 1990
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Canada	Not stated.	Not stated.	Not stated.			Not specified	Roberts et al., 1991
Lactobacillus	*Lactobacillus spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Canada	Not stated.	Not stated.	Not stated.			Not specified	Roberts et al., 1991
Lactobacillus	*L. rhamnosus*	Microbiological phenotype	Splenic abscess and sepsis	Abscess	Male	48	United States	Diabetes mellitus, renal transplant 6 months prior, HIV+ve. removal of spleen	Compromized	Diabetes mellitus			Cured	Sherman et al., 1987
Lactobacillus	*L. acidophilus*	API (API32A)	Pneumonia	Organ failure	Male	4	Germany	Immunosuppression for vasculitis, neutropenia.	Compromized	Immunodeficiency			Death	Sriskandan et al., 1993
Lactobacillus	*L. fermentum*	API (API32A)	Pneumonia	Organ failure	Male	46	Germany	AIDS, haemophiliac, neuropenia. Pneumonia (Pseudomonas and cytomegalovirus) treated with vancomycin and other antibiotics.	Compromized	Immunodeficiency			Death	Sriskandan et al., 1993
Lactobacillus	*L. rhamnosus*	API (API32A)	Bilateral pneumonia	Organ failure	Not specified	Not specified	Germany	Aplastic anaemia, Hepatits C.	Compromized	Immunodeficiency			Death	Sriskandan et al., 1993
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacterial cystitis	Abscess	Female	Not specified	New Zealand	Not stated.	Not stated.	Not stated.			Cured	Tait et al. 1985
Lactobacillus	*L. rhamnosus*	Microbiological phenotype	Septicaemia	Bacteraemia / Septicaemia	Female	27	France	Intestinal decontamination therapy, acute leukaemia. Death due to E. cloacae bacteraemia 2w after release	Compromized	Immunodeficiency			Cured	Tandé et al., 1992
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Liver abscess	Abscess	Female	86	United States	non-insulin –dependent diabetes millitus, chronic cholecystitus.	Compromized	Diabetes mellitus			Cured	Klein et al., 1991
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Pulmonary abscess	Abscess	Female	18	Finland	Diabetic coma.	Compromized	Diabetes mellitus			Cured	Kortilla, 1953
Lactobacillus	*L. rhamnosus*	API (API50CHL)	Septicaemia	Bacteraemia / Septicaemia	Male	22	Norway	Multiple metastases in the lungs, chemutherapy, surgery.	Compromized	Immunodeficiency			Cured	Jureen et al., 2002
Lactobacillus	*L. salivarius*	16S RNA sequence clustering	Bacteremic cholecystitis	Bacteraemia / Septicaemia	Male	70	Hong Kong	Parkinson's disease, stable chronic obstructive pulmonary disease.	Competent	Metabolism disorder / Organ failure			Cured	Woo et al., 2002
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	53	Spain	Leukaemia	Compromized	Immunodeficiency			Cured	Rodriguez et al., 2001
Lactobacillus	*L. rhamnosus*	Ribotyping	Bacteraemia	Bacteraemia / Septicaemia	Male	40	Italy	Lung transplant, antibiotic therapy.	Compromized	Immunodeficiency			Cured	Carretto et al., 2001
Lactobacillus	*Lactobacillus spp.*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Mexico	Not stated.	Not stated.	Not stated.			Not specified	Cuchacovich et al. 2002
Lactobacillus	*L. rhamnosus*	Not specified	Septicaemia	Bacteraemia / Septicaemia	Female	42	United Kingdom	Sjorgren's syndrome, idiopathic renal failure, idiopathic axonal peripheral neuropathy, chemo-immunosupression, prolonged vancomycin treatment.	Compromized	Immunodeficiency			Death	MacGregor et al., 2002
Lactobacillus	*L. catenaforme*	Microbiological phenotype	Peritonsillar abscess	Abscess	Male	45	United States	Dilated cardiomyopathy, hypertension, alcohol and cocaine abuse.	Compromized	Immunodeficiency			Cured	Civen et al., 1993
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Peritonsillar abscess	Abscess	Male	45	United States	Dilated cardiomyopathy, hypertension, alcohol and cocaine abuse.	Compromized	Immunodeficiency			Cured	Civen et al., 1993
Lactobacillus	*L. delbrueckii*	Not specified	D lactic acidosis	Metabolism Disorder	Female	56	Italy	Major intestinal resection for no Hodgkin's lymphoma	Compromized	Immunodeficiency			Cured	Gavazzi et al. 2001
Lactobacillus	*Lactobacillus spp.*	Not specified	Ventilator associated pneumonia	Organ failure	Female	39	United States	Car accident (rib and leg fractures, pulmonary contusion), diabetes mellitus, Crohn's disease, obesity,.	Compromized	Diabetes mellitus			Cured	Wood et al., 2002
Lactobacillus	*L. rhamnosus*	16S RNA sequence clustering	Endocarditis	Endocarditis	Male	73	France	prosthetic valve for treatment of aortic stenosis	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Not specified	Wallet et al. 2002
Lactobacillus	*L. casei*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. casei*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. casei*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. casei*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. casei*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. casei*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. casei*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. fermentum*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. fermentum*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. fermentum*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. fermentum*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. fermentum*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. fermentum*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. fermentum*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. fermentum*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. fermentum*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. gasseri*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. gasseri*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. jensenii*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. jensenii*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002

GENRE	Organism	Identification	Clinical Diagnosis	SEPSIS	Sexe	Age (NUM)	Pays	Details (Risk Factor & Predisposing causes, Source of isolation)	Immunostatus	RISK FACTOR	Antibiotherapy : 1st Line	Antibiotherapy : 2nd Line	Outcome	Reference
Lactobacillus	*L. rhamnosus*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus GG*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus GG*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus GG*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus GG*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus GG*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus GG*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus GG*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus GG*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus GG*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus GG*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. rhamnosus GG*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. sakei*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. zeae*	species specific PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Finland	Not stated.	Not stated.	Not stated.			Not specified	Salminen et al., 2002
Lactobacillus	*L. paracasei*	Microbiological phenotype	Peritonitis	Abscess	Male	65	United States	Diabetic, end-stage renal disease on CAPD treatment. Prolonged vancomycin therapy.	Compromized	Diabetes mellitus			Cured	Neef et al., 2003
Lactobacillus	*L. jensenii*	API (API 20A)	Submental abscess	Abscess	Male	25	Spain	Immunocompetent patient	Competent	Wound and/or Invasive procedure			Cured	Fajardo et al., 2002
Lactobacillus	*L. paracasei*	Biolog, RAPD PCR	Endocarditis	Endocarditis	Female	75	Austria	Previous history of stroke and atrial fibrillation. Severe aortic atenosis and a combined mitral stenosis	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Soleman et al., 2003
Lactobacillus	*L. casei*	16S RNA sequence clustering	Endocarditis	Endocarditis	Male	53	Portugal	History of rheumatic fever. Dental extraction 3 months prior.	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Zé-Zé et al., 2000
Lactobacillus	*Lactobacillus spp.*	Not specified	Endocarditis	Endocarditis	Not specified	Not specified	United Kingdom	Not stated.	Not stated.	Not stated.			Not specified	Johnson et al. 2001
Lactobacillus	*L. rhamnosus GG*	Not specified	Bacteraemia	Bacteraemia / Septicaemia	Male	0	United States	36w gestation Infant with short gut syndrome secondary to congenital intestinal atresia and volvulus. Dependent on total parenteral nutrition. Choleostasis.	Competent	Metabolism disorder / Organ failure			Cured	Kunz et al., 2004
Lactobacillus	*L. rhamnosus GG*	Not specified	Bacteraemia	Bacteraemia / Septicaemia	Male	0	United States	34w gestation Infant with gastroschisis, underwent gastrostomy and jejunostomy at birth. Total parenteral nutrition. Developed cholestatic liver disease.	Competent	Wound and/or Invasive procedure			Cured	Kunz et al., 2004
Lactobacillus	*L. acidophilus*	Microbiological phenotype	D-lactic acidosis	Metabolism Disorder	Male	30	United States	Use of L. acidophilus tablets	Competent	LAB Tablets / Probiotic use			Cured	Oh et al. 1979
Lactobacillus	*L. casei*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Female	41	Hong Kong	Chronic myeloid leukaemia.	Compromized	Immunodeficiency			Death	Lau et al. 2004
Lactobacillus	*L. rhamnosus*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Male	50	Hong Kong	Diabetes mellitus	Compromized	Diabetes mellitus			Cured	Lau et al. 2004
Lactobacillus	*L. rhamnosus*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Male	68	Hong Kong	Carcinoma of oesophagus	Compromized	Immunodeficiency			Death	Lau et al. 2004
Lactobacillus	*L. rhamnosus GG*	Rep PCR	Septicaemia	Bacteraemia / Septicaemia	Male	0	United States	structural heart problems, vfollowing catheterisation and antibiotic treatment.	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Land et al., 2005
Lactobacillus	*L. rhamnosus GG*	Rep PCR	Septicaemia	Bacteraemia / Septicaemia	Female	6	United States	A 6 year old with cerebal palsy, microcephaly, seizure disorder, fed through intubation, with a urinary infection and following surgery.	Competent	Wound and/or Invasive procedure			Cured	Land et al., 2005
Lactobacillus	*L. acidophilus*	API (RapidID32A)	Endocarditis	Endocarditis	Male	61	Spain	Myocardiopathy	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Romero-Perez et al., 2003
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Peritonitis	Abscess	Male	43	Taïwan	Liver cirrhosis.	Compromized	Immunodeficiency			Death	Lee et al., 2004
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Peritonitis	Abscess	Male	61	Taïwan	Liver cirrhosis.	Compromized	Immunodeficiency			Death	Lee et al., 2004
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Peritonitis	Abscess	Male	40	Taïwan	Liver cirrhosis.	Compromized	Immunodeficiency			Cured	Lee et al., 2004
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Peritonitis	Abscess	Male	85	Taïwan	Ascending colon cancer	Compromized	Immunodeficiency			Death	Lee et al., 2004
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Peritonitis	Abscess	Male	38	Taïwan	End Stage renal disease. Liver cirrhosis	Compromized	Immunodeficiency			Death	Lee et al., 2004
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Peritonitis	Abscess	Male	56	Taïwan	Descending aortic anurysm rupture	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Lee et al., 2004
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Peritonitis	Abscess	Male	66	Taïwan	Blunt abdominal trauma	Competent	Wound and/or Invasive procedure			Cured	Lee et al., 2004
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Peritonitis	Abscess	Female	60	Taïwan	Liver cirrhosis.	Compromized	Immunodeficiency			Death	Lee et al., 2004
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Peritonitis	Abscess	Female	88	Taïwan	Raidation enteritis. Small bowell perforation	Competent	Wound and/or Invasive procedure			Death	Lee et al., 2004
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Peritonitis	Abscess	Male	68	Taïwan	Blunt abdominal trauma	Competent	Wound and/or Invasive procedure			Death	Lee et al., 2004
Lactobacillus	*L. paracasei*	16S RNA sequence clustering	Pancreatic Necrosis	Organ failure	Male	52	Switzerland	Immunosuppression	Compromized	Immunodeficiency			Cured	Z'Graggen et al. 2005
Lactobacillus	*L. gasseri*	DNA sequences	Fournier's gangrene	Organ failure	Male	57	United States	Spina bifida repaired at birth and secondary intermittent urinary and fecal incontinence presened with erythema and edema of the scrotum	Competent	Wound and/or Invasive procedure			Cured	Tleyjeh et al., 2004
Lactobacillus	*L. casei*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Not specified	Christensen et al. 2004
Lactobacillus	*L. rhamnosus*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Not specified	Christensen et al. 2004
Lactobacillus	*L. rhamnosus*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Not specified	Christensen et al. 2004
Lactobacillus	*L. acidophilus*	Not specified	Mitral Valve Bacterial Endocarditis	Endocarditis	Female	63	United States	Multiple cycle of chemotherapy	Compromized	Immunodeficiency			Cured	Makaryus et al. 2005
Lactobacillus	*L. rhamnosus GG*	PFGE, Ribotyping	Bacteraemia	Bacteraemia / Septicaemia	Male	0	United States	Short gut syndrome.	Competent	Metabolism disorder / Organ failure			Cured	De Groote et al., 2005
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Endocarditis	Endocarditis	Female	62	United States	Recent dental work. No ingestion of probiotics	Competent	Dental work			Cured	Salvana et al 2005
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	38	United States	AIDS, Hodgkin's disease. Probiotic medication (Wich One ?)	Compromized	Immunodeficiency			Cured	Ledoux et al. 2006
Lactobacillus	*L. acidophilus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. acidophilus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. acidophilus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. acidophilus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. crispatus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. curvatus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. delbrueckii*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. fermentum*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. fermentum*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006

GENRE	Organism	Identification	Clinical Diagnosis	SEPSIS	Sexe	Age (NUM)	Pays	Details (Risk Factor & Predisposing causes, Source of isolation)	Immunostatus	RISK FACTOR	Antibiotherapy : 1st Line	Antibiotherapy : 2nd Line	Outcome	Reference
Lactobacillus	*L. fermentum*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. paracasei*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. paracasei*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. paracasei*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. paracasei*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. paracasei*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. paracasei*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. paracasei*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. paracasei*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. plantarum*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. plantarum*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. plantarum*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. plantarum*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. plantarum*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. plantarum*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. plantarum*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. rhamnosus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. rhamnosus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. rhamnosus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. rhamnosus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. rhamnosus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. rhamnosus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. rhamnosus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. rhamnosus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. rhamnosus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. rhamnosus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. rhamnosus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. rhamnosus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. rhamnosus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. rhamnosus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. rhamnosus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. rhamnosus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. rhamnosus*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*Lactobacillus spp.*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*Lactobacillus spp.*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.	Not stated.	Not stated.			Not specified	Sullivan et al. 2006
Lactobacillus	*L. buchneri*	Microbiological phenotype	D-lactic acidosis	Metabolism Disorder	Female	3	Japan	ventricular septal defect	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Satoh et al. 1982
Lactobacillus	*L. fermenti*	Microbiological phenotype	D-lactic acidosis	Metabolism Disorder	Male	6	Japan	mesenteric lymphangiona	Compromized	Immunodeficiency			Cured	Satoh et al. 1982
Lactobacillus	*L. paracasei*	16S RNA sequence clustering	Liver abscess	Abscess	Female	51	United Kingdom	Purpura fulminans	Competent	Polymicrobial Infection			Cured	Burns et al. 2007
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Fever. Arthritis of right shoulder	Bacteraemia / Septicaemia	Female	49	France	Diabetes mellitus. Fever	Compromized	Diabetes mellitus			Cured	Chanet et al. 2007
Lactobacillus	*L. fermentum*	16S RNA sequence clustering	Surgical site abscess	Abscess	Female	53	Hong Kong	thransthoracic esophagectomy	Competent	Wound and/or Invasive procedure			Cured	Woo et al. 2007
Lactobacillus	*L. carnosus*	BACT Alert	Bacteraemia	Bacteraemia / Septicaemia	Male	12	Czech republic	Ependymoma	Compromized	Immunodeficiency			Cured	Svec et al. 2007
Lactobacillus	*L. curvatus*	BACT Alert	Bacteraemia	Bacteraemia / Septicaemia	Male	18	Czech republic	Polytraumatism due to a fall	Competent	Wound and/or Invasive procedure			Cured	Svec et al. 2007
Lactobacillus	*L. fermentum*	BACT Alert	Bacteraemia	Bacteraemia / Septicaemia	Female	92	Czech republic	Diabetes mellitus	Compromized	Diabetes mellitus			Death	Svec et al. 2007
Lactobacillus	*L. paracasei*	BACT Alert	Bacteraemia	Bacteraemia / Septicaemia	Male	2	Czech republic	Burn Injury 3rd degree	Compromized	Immunodeficiency			Cured	Svec et al. 2007
Lactobacillus	*L. plantarum*	BACT Alert	Bacteraemia	Bacteraemia / Septicaemia	Female	37	Czech republic	Bronchial asthma	Compromized	Immunodeficiency			Death	Svec et al. 2007
Lactobacillus	*L. rhamnosus*	BACT Alert	Bacteraemia	Bacteraemia / Septicaemia	Male	0	Czech republic	Congenital volvulus, bowel necrosis	Competent	Metabolism disorder / Organ failure			Cured	Svec et al. 2007
Lactobacillus	*L. rhamnosus*	BACT Alert	Bacteraemia	Bacteraemia / Septicaemia	Female	49	Czech republic	Ovarian cancer	Compromized	Immunodeficiency			Death	Svec et al. 2007
Lactobacillus	*L. salivarius*	BACT Alert	Bacteraemia	Bacteraemia / Septicaemia	Male	67	Czech republic	Malignant Lymphoproliferation	Compromized	Immunodeficiency			Death	Svec et al. 2007
Lactobacillus	*L. paracasei*	API (API50CHL)	Endocarditis	Endocarditis	Not specified	Not specified	Australia	Not stated.	Not stated.	Not stated.			Not specified	Harty et al. 1993
Lactobacillus	*L. paracasei*	API (API50CHL)	Endocarditis	Endocarditis	Not specified	Not specified	Australia	Not stated.	Not stated.	Not stated.			Not specified	Harty et al. 1993
Lactobacillus	*L. paracasei*	API (API50CHL)	Endocarditis	Endocarditis	Not specified	Not specified	Australia	Not stated.	Not stated.	Not stated.			Not specified	Harty et al. 1993
Lactobacillus	*L. paracasei*	API (API50CHL)	Endocarditis	Endocarditis	Not specified	Not specified	Australia	Not stated.	Not stated.	Not stated.			Not specified	Harty et al. 1993
Lactobacillus	*L. paracasei*	API (API50CHL)	Endocarditis	Endocarditis	Not specified	Not specified	Australia	Not stated.	Not stated.	Not stated.			Not specified	Harty et al. 1993
Lactobacillus	*L. rhamnosus*	API (API50CHL)	Endocarditis	Endocarditis	Not specified	Not specified	Australia	Not stated.	Not stated.	Not stated.			Not specified	Harty et al. 1993
Lactobacillus	*L. rhamnosus*	API (API50CHL)	Endocarditis	Endocarditis	Not specified	Not specified	Australia	Not stated.	Not stated.	Not stated.			Not specified	Harty et al. 1993
Lactobacillus	*L. rhamnosus*	API (API50CHL)	Endocarditis	Endocarditis	Not specified	Not specified	Australia	Not stated.	Not stated.	Not stated.			Not specified	Harty et al. 1993
Lactobacillus	*L. rhamnosus*	API (API50CHL)	Endocarditis	Endocarditis	Not specified	Not specified	Australia	Not stated.	Not stated.	Not stated.			Not specified	Harty et al. 1993
Lactobacillus	*L. rhamnosus*	API (API50CHL)	Endocarditis	Endocarditis	Not specified	Not specified	Australia	Not stated.	Not stated.	Not stated.			Not specified	Harty et al. 1993
Lactobacillus	*L. casei*	Not specified	Osler disease	Endocarditis	Male	64	France	None.Poor dentitions (granulomas)	Competent	Dental work			Death	Jeandet 1963
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Endocarditis	Endocarditis	Female	21	Germany	Acute rheumatic fever. Arthralgia	Not stated.	Not stated.			Death	Marschall 1938
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Endocarditis	Endocarditis	Male	82	Switzerland	Aortic ejection systolic murmur	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Schoevaerds et al. 2002
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Endocarditis	Endocarditis	Male	67	United States	Recent dental work. No ingestion of probiotics	Competent	Dental work			Cured	Feldmesser et al. 1999
Lactobacillus	*L. curvatus*	API (API50CH), PFGE	Bacteraemia	Bacteraemia / Septicaemia	Female	70	Danemark	Acute myocardial infarction.	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Cured	Arpi et al. 2003
Lactobacillus	*L. lactis*	API (API50CH), PFGE	Bacteraemia	Bacteraemia / Septicaemia	Male	76	Danemark	history of prostatic carcinoma	Compromized	Immunodeficiency			Cured	Arpi et al. 2003
Lactobacillus	*L. paracasei*	API (API50CH), PFGE	Bacteraemia	Bacteraemia / Septicaemia	Female	77	Danemark	history of universal artherosclerosis	Competent	Metabolism disorder / Organ failure			Cured	Arpi et al. 2003
Lactobacillus	*L. rhamnosus*	API (API50CH), PFGE	Endocarditis	Endocarditis	Male	45	Danemark	Poor dental status.	Competent	Dental work			Cured	Arpi et al. 2003

GENRE	Organism	Identification	Clinical Diagnosis	SEPSIS	Sexe	Age (NUM)	Pays	Details (Risk Factor & Predisposing causes, Source of isolation)	Immunostatus	RISK FACTOR	Antibiotherapy : 1st Line	Antibiotherapy : 2nd Line	Outcome	Reference
Lactobacillus	*L. rhamnosus*	API (API50CH), PFGE	Bacteraemia	Bacteraemia / Septicaemia	Male	37	Danemark	Crohn's disease	Compromized	Immunodeficiency			Cured	Arpi et al. 2003
Lactobacillus	*L. rhamnosus*	API (API50CH), PFGE	Bacteraemia	Bacteraemia / Septicaemia	Male	74	Danemark	several previous episodes of urosepsis	Competent	Metabolism disorder / Organ failure			Cured	Arpi et al. 2003
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Neonatal meningitis	Organ failure	Male	0	United States	Not stated.	Not stated.	Not stated.			Cured	Broughton et al. 1983
Lactobacillus	*L. casei*	Microbiological phenotype	Septicaemia and pelvic abscess formation with posthysterectomy	Abscess	Female	62	United States	mixed Mullerian tumor of the uterus	Compromized	Immunodeficiency			Cured	Connor et al. 1994
Lactobacillus	*L. plantarum*	Microbiological phenotype	Liver abscess	Abscess	Male	75	Japan	Intratumoral Ethanol Injection Therapy for HCC	Competent	Wound and/or Invasive procedure			Cured	Isobe et al. 1990
Lactobacillus	*L. casei*	16S RNA sequence clustering	Septicaemia	Bacteraemia / Septicaemia	Male	70	France	Paraprosthetic Enteric Fistula. Co Infection *Candida albicans* and *Candida tropicalis*	Competent	Wound and/or Invasive procedure			Cured	Parola et al. 1998
Lactobacillus	*L. plantarum*	Microbiological phenotype	Septicaemia	Bacteraemia / Septicaemia	Male	70	Belgium	Dysphagia. Oesophageal carcinoma	Compromized	Immunodeficiency			Death	Potvliege et al. 1988
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Meningitis	Organ failure	Male	38	Austria	Not stated.	Not stated.	Not stated.			Death	Kuchinka
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Meningitis	Organ failure	Female	31	Austria	Not stated.	Not stated.	Not stated.			Death	Kuchinka
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Peritonitis	Abscess	Male	61	United States	CAPD	Competent	Wound and/or Invasive procedure			Cured	Schleifer et al. 1989
Lactobacillus	*L. fermentum*	API (API Strep)	Peritonitis	Abscess	Male	71	United Kingdom	Adenocarcinoma	Compromized	Immunodeficiency			Cured	Greig et al. 1997
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Soft Tissue Abscess	Abscess	Male	47	United States	Co infection with Torulopsis glabrata. Diabetes mellitus, Renal faiure, ischiorectal abscess	Compromized	Diabetes mellitus			Cured	Hosford et al. 1985
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Endocarditis	Endocarditis	Male	43	United States	Intravenous drug abuse	Competent	Wound and/or Invasive procedure			Death	Amrikachi et al. 1997
Lactobacillus	*L. rhamnosus*	API (API50CHL)	Bacteraemia	Bacteraemia / Septicaemia	Female	14	Germany	Acute Myeoloid Leukaemia	Compromized	Immunodeficiency			Cured	Majcher et al. 1999
Lactobacillus	*L. casei*	API (API50 CHL)	Bacteraemia	Bacteraemia / Septicaemia	Male	40	Spain	[colangiopancreatografia retrograda endoscopica]	Competent	Metabolism disorder / Organ failure			Cured	Alberte et al. 2003
Lactobacillus	*L. acidophilus*	Microbiological phenotype	Liver abscess	Abscess	Male	27	Croatia	Crohn's disease	Compromized	Immunodeficiency			Cured	Cukovic-Cavka et al. 2006
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Posttraumatic Endophtalmitis	Abscess	Male	31	United States	Sanitation worker.	Competent	Polymicrobial Infection			Cured	Dickens et al. 1993
Lactobacillus	*L. casei*	Western Blot Analysis	Endocarditis	Endocarditis	Male	53	United States	Not stated.	Not stated.	Not stated.			Cured	Inman et al. 1984
Lactobacillus	*L. jensenii*	Not specified	Endocarditis	Endocarditis	Female	16	United States	Not stated.	Not stated.	Not stated.			Cured	Khan et al. 2005
Lactobacillus	*L. rhamnosus*	API (API 50CH)	Hepatic Abscess	Abscess	Female	73	Argentina	Diabetes mellitus	Compromized	Diabetes mellitus			Cured	Notario et al. 2003
Lactobacillus	*Lactobacillus spp.*	Not specified	cholangitis	Organ failure	Not specified	Not specified	Russia	choledocholithiasis	Competent	Metabolism disorder / Organ failure			Not specified	Panov et al. 1991
Lactobacillus	*Lactobacillus spp.*	Not specified	cholangitis	Organ failure	Not specified	Not specified	Russia	choledocholithiasis	Competent	Metabolism disorder / Organ failure			Not specified	Panov et al. 1991
Lactobacillus	*Lactobacillus spp.*	Not specified	cholangitis	Organ failure	Not specified	Not specified	Russia	choledocholithiasis	Competent	Metabolism disorder / Organ failure			Not specified	Panov et al. 1991
Lactobacillus	*Lactobacillus spp.*	Not specified	cholangitis	Organ failure	Not specified	Not specified	Russia	choledocholithiasis	Competent	Metabolism disorder / Organ failure			Not specified	Panov et al. 1991
Lactobacillus	*Lactobacillus spp.*	Not specified	cholangitis	Organ failure	Not specified	Not specified	Russia	choledocholithiasis	Competent	Metabolism disorder / Organ failure			Not specified	Panov et al. 1991
Lactobacillus	*Lactobacillus spp.*	Not specified	cholangitis	Organ failure	Not specified	Not specified	Russia	choledocholithiasis	Competent	Metabolism disorder / Organ failure			Not specified	Panov et al. 1991
Lactobacillus	*Lactobacillus spp.*	Not specified	cholangitis	Organ failure	Not specified	Not specified	Russia	choledocholithiasis	Competent	Metabolism disorder / Organ failure			Not specified	Panov et al. 1991
Lactobacillus	*Lactobacillus spp.*	Not specified	cholangitis	Organ failure	Not specified	Not specified	Russia	choledocholithiasis	Competent	Metabolism disorder / Organ failure			Not specified	Panov et al. 1991
Lactobacillus	*Lactobacillus spp.*	Not specified	cholangitis	Organ failure	Not specified	Not specified	Russia	choledocholithiasis	Competent	Metabolism disorder / Organ failure			Not specified	Panov et al. 1991
Lactobacillus	*Lactobacillus spp.*	Not specified	cholangitis	Organ failure	Not specified	Not specified	Russia	choledocholithiasis	Competent	Metabolism disorder / Organ failure			Not specified	Panov et al. 1991
Lactobacillus	*Lactobacillus spp.*	Not specified	cholangitis	Organ failure	Not specified	Not specified	Russia	choledocholithiasis	Competent	Metabolism disorder / Organ failure			Not specified	Panov et al. 1991
Lactobacillus	*Lactobacillus spp.*	Not specified	cholangitis	Organ failure	Not specified	Not specified	Russia	choledocholithiasis	Competent	Metabolism disorder / Organ failure			Not specified	Panov et al. 1991
Lactobacillus	*Lactobacillus spp.*	Not specified	Pulmonary infection	Organ failure	Male	67	Spain	Tobacco use. Pulmonary Tuberculosis	Compromized	Immunodeficiency			Cured	Prats et al. 1992
Lactobacillus	*L. jensenii*	16S RNA sequence clustering	Septicaemia	Bacteraemia / Septicaemia	Female	50	France	Chronic renal failure	Competent	Metabolism disorder / Organ failure			Cured	Moudden et al. 2007
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Sepsis	Bacteraemia / Septicaemia	Female	68	United States	Diabetes mellitus	Compromized	Diabetes mellitus			Death	Wang et al. 1999
Lactobacillus	*L. rhamnosus*	16S RNA sequence clustering	Abdominal wall abscess	Abscess	Female	35	France	Parenteral nutrition, Pancreatitis	Compromized	Immunodeficiency			Cured	Brahimi et al. 2007
Lactobacillus	*L. rhamnosus*	16S RNA sequence clustering	Abdominal wall abscess, Bacteraemia	Bacteraemia / Septicaemia	Female	70	France	Parenteral nutrition, Immunocompromized, Pancreatitis	Compromized	Immunodeficiency			Cured	Brahimi et al. 2007
Lactobacillus	*L. fermentum*	Microbiological phenotype	D Lactic Acidosis	Metabolism Disorder	Male	6	France	Short bowel syndrome. Neonate. Encephalopathis	Competent	Metabolism disorder / Organ failure			Cured	Dahhak et al. 2008
Lactobacillus	*L. rhamnosus*	Not specified	Bacterial Meningoencephalitis	Organ failure	Male	69	Germany	Bacterial Endocarditis	Competent	Metabolism disorder / Organ failure			Death	Wolz et al. 2008
Lactobacillus	*L. rhamnosus*	API (API 50CH)	Septicaemia	Bacteraemia / Septicaemia	Female	54	Lebanon	Diabetes mellitus. Probiotics self medication	Compromized	Diabetes mellitus			Cured	Zein et al. 2008
Lactobacillus	*L. jensenii*	16S RNA sequence clustering	Bacteraemia and pyelonephritis	Bacteraemia / Septicaemia	Female	59	Israel	Follicular breast lymphoma, Diabete Mellitus Type 2	Compromized	Immunodeficiency			Cured	Chazan et al. 2008
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Endocarditis	Endocarditis	Male	42	Japan	Heavy drinker.	Compromized	Immunodeficiency			Cured	Yagi et al. 2008
Lactobacillus	*L. casei*	Microbiological phenotype	Septicaemia	Bacteraemia / Septicaemia	Female	51	France	Crohn's disease	Compromized	Immunodeficiency			Cured	Nicolas et al. 1984
Lactobacillus	*Lactobacillus spp.*	PCR Genus specific	Not specified	Not specified	Not specified	Not specified	Thailand	HIV	Compromized	Immunodeficiency			Cured	Kulchiwitt et al. 2005
Lactobacillus	*Lactobacillus spp.*	PCR Genus specific	Not specified	Not specified	Not specified	Not specified	Thailand	Pancreatic carcinoma	Compromized	Immunodeficiency			Cured	Kulchiwitt et al. 2005
Lactobacillus	*L. bulgaricus*	Not specified	Primary biliary cirrhosis	Organ failure	Female	39	United Kingdom	Probiotic Vaccination for recurrent vaginitis	Compromized	Immunodeficiency			Cured	Bogdanos et al. 2008
Lactobacillus	*L. casei*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Male	66	Italy	persistent fever, night sweating, hypertension, diverticulosis, haemorrhoidal bleeding and chronic obstructive pulmonary disease with periodic exarcerbations. Probiotic consumption	Competent	Metabolism disorder / Organ failure			Cured	Tommasi et al. 2008
Lactobacillus	*L. delbrueckii*	16S RNA sequence clustering	Urinary tract infection	Organ failure	Female	85	United States	Vaginal prolapse in 1999	Competent	Metabolism disorder / Organ failure			Cured	Darbro et al. 2008
Lactobacillus	*L. acidophilus*	Not specified	D Lactic Acidosis	Metabolism Disorder	Male	10	Hong Kong	Short-bowel syndrome. Adrenal neuroblastoma. Lactobacillus acidophilus and Bifidobacterium spp.	Competent	LAB Tablets / Probiotic use	N6 Protocol (cyclophosphamide, doxorubicin, vincrisitne, cisplatin, etoposide)		Cured	Ku et al. 2006

GENRE	Organism	Identification	Clinical Diagnosis	SEPSIS	Sexe	Age (NUM)	Pays	Details (Risk Factor & Predisposing causes, Source of isolation)	Immunostatus	RISK FACTOR	Antibiotherapy : 1st Line	Antibiotherapy : 2nd Line	Outcome	Reference
Lactobacillus	*Lactobacillus spp.*	Not specified	Endocarditis	Endocarditis	Male	22	Switzerland	Congenital stenosis of bicuspid aortic valve	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis	Amoxicillin, Gentamycine		Cured	Noti et al. 2009
Lactobacillus	*L. paracasei*	API 50 CHL	Infected knee replacement	Abscess	Male	81	United Kingdom	Ostheoarthritis, Hypertension with peripheral vascular disease	Compromized	Wound and/or Invasive procedure	-	Amoxicillin and Clindamycin	Cured	Atwal et al. 2009
Lactobacillus	*L. rhamnosus*	16S RNA sequence clustering	Hepatic abscess	Abscess	Male	74	Hong Kong	Carcinoma, Chemoradiotherapy and Diabetes Mellitus	Compromized	Immunodeficiency	-	Clarithromycin, metrodinazole and levofloxacin	Cured	Chan et al. 2009
Lactobacillus	*L. acidophilus*	Not specified	D Lactic Acidosis	Metabolism Disorder	Female	5	Japan	Short-bowel syndrome. Resection of the small intestine on the day following birth for jejunoileal atresia. Probiotic consumption of Lactomin	Competent	Metabolism disorder / Organ failure		Cefdinir	Cured	Munakata et al. 2009
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Intraabdominal	Abscess	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Not specified	Thirumoorthi et al. 1976
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Soft tissues	Abscess	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Not specified	Thirumoorthi et al. 1976
Lactobacillus	*L. rhamnosus*	16S RNA sequence clustering	Lung abscess and pleuritis	Abscess	Male	79	Japan	lung had an impaired local immunosystem, due to emphysema	Compromized	Immunodeficiency	teicoplanin (TEIC; 400 mg/day) and meropenem (2.0 g/day)	clindamycin	Cured	Shoji et al. 2010
Lactobacillus	*L. jensenii*	16S RNA Sequence	Endocarditis	Endocarditis	Female	47	Italy	Replaced mitral valve	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis	Amoxicillin, clavulanic acid	Teicolplanin, Meropenem	Cured	Fradiani et al. 2010
Lactobacillus	*L. casei*	16S RNA sequence clustering	Endocarditis	Endocarditis	Male	77	Spain	History of heart disease	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis	Vancomycin	Ampicillin	Death	Cabrera et al. 2010
Lactobacillus	*L. casei*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Female	75	Italy	Central Venous Catheter	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis	Ampicillin	Amoxicillin	Cured	Russo et al. 2010
Lactobacillus	*L. brevis*	Not specified	Endophtalmitis	Abscess	Female	76	Greece	Trabeculectomy performed during ologen implant. Diabetic patient	Competent	Wound and/or Invasive procedure	Vancomycin and amikacin		Cured	Papaconstantinou et al. 2010
Lactobacillus	*Lactobacillus spp.*	Not specified	Liver abscess	Organ failure	Male	77	United States	pancreatic resecetion for adenocarcinoma	Compromized	Immunodeficiency	Piperacillin Tazobacatam	Ertapenem	Cured	Bonatti et al. 2010
Lactobacillus	*L. delbrueckii*	16S RNA sequence clustering	Urinary tract infection	Organ failure	Female	84	France	Not stated.	Not stated.	Not stated.	not specified	not specified	Cured	Bernier et al. 2010
Lactobacillus	*L. delbrueckii*	16S RNA sequence clustering	Urinary tract infection	Organ failure	Female	82	France	Not stated.	Not stated.	Not stated.	not specified	not specified	Cured	Bernier et al. 2010
Lactobacillus	*L. delbrueckii*	16S RNA sequence clustering	Urinary tract infection	Organ failure	Female	84	France	Not stated.	Not stated.	Not stated.	not specified	not specified	Cured	Bernier et al. 2010
Lactobacillus	*L. delbrueckii*	16S RNA sequence clustering	Urinary tract infection	Organ failure	Female	74	France	Not stated.	Not stated.	Not stated.	not specified	not specified	Cured	Bernier et al. 2010
Lactobacillus	*L. delbrueckii*	16S RNA sequence clustering	Urinary tract infection	Organ failure	Female	72	France	Not stated.	Not stated.	Not stated.	not specified	not specified	Cured	Bernier et al. 2010
Lactobacillus	*L. delbrueckii*	16S RNA sequence clustering	Urinary tract infection	Organ failure	Female	82	France	Not stated.	Not stated.	Not stated.	not specified	not specified	Cured	Bernier et al. 2010
Lactobacillus	*L. delbrueckii*	16S RNA sequence clustering	Urinary tract infection	Organ failure	Female	82	France	Not stated.	Not stated.	Not stated.	not specified	not specified	Cured	Bernier et al. 2010
Lactobacillus	*L. delbrueckii*	16S RNA sequence clustering	Urinary tract infection	Organ failure	Female	90	France	Not stated.	Not stated.	Not stated.	not specified	not specified	Cured	Bernier et al. 2010
Lactobacillus	*L. paracasei*	16S RNA sequence clustering	Splenic Abscess	Abscess	Male	36	Japan	Type 2 Diabete Mellitus	Compromized	Immunodeficiency	Ampicillin	Clindamycin	Cured	Doi et al. 2010
Lactobacillus	*L. rhamnosus*	API 50CH	Meningitis	Bacteraemia / Septicaemia	Male	10	France	Stem Cell Transplantation	Compromized	Immunodeficiency	Clindamycin		Cured	Robin et al. 2010
Lactobacillus	*L. rhamnosus GG*	16S RNA sequence clustering	Empyema	Abscess	Male	56	United States	Cardiothoracic Transplant Recipients	Compromized	Immunodeficiency	Ampicillin		Cured	Luong et al. 2010
Lactobacillus	*L. fermentum*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactobacillus	*L. fermentum*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactobacillus	*L. fermentum*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactobacillus	*L. salivarius*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactobacillus	*L. salivarius*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactobacillus	*L. salivarius*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactobacillus	*L. salivarius*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactobacillus	*L. salivarius*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactobacillus	*L. salivarius*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactobacillus	*L. salivarius*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactobacillus	*L. salivarius*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactobacillus	*L. rhamnosus*	16S RNA sequence clustering	Meningitis	Bacteraemia / Septicaemia	Female	80	France	Anterior Cervical Spine Surgery	Competent	Wound and/or Invasive procedure			Death	Schmidt et al. 2011
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Endophtalmitis	Abscess	Male	17	United States	Orthodontic treatment	Competent	Wound and/or Invasive procedure	Ciprofloxacin		Cured	Wirotsko et al. 2002
Lactobacillus	*L. rhamnosus*	Microbiological phenotype	Endocarditis	Endocarditis	Female	57	United States	Implantation of porcine bioprothesis	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis	not specified	not specified	Cured	Knight et al. 1983
Lactobacillus	*Lactobacillus spp.*	Microbiological phenotype	Endocarditis	Endocarditis	Not specified	Not specified	Mexico	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Reyes Bribiesca et al. 1989
Lactobacillus	*L. rhamnosus*	Microbiological phenotype	Endocarditis	Endocarditis	Male	40	United States	history of uncontrolled blood sugar and diabetic ketoacidosis	Compromized	Diabetes mellitus	vancomycin and cefepime	IV meropenem	Cured	Antoun et al., 2020
Lactobacillus	*L. acidophilus*	Not specified	Bacteraemia	Bacteraemia / Septicaemia	Female	40		poorly controlled type 2 diabetes mellitus (DM), prior history of transient ischemic attacks (TIAs) related to drug use, current smoker, with a history of polysubstance abuse (including alcohol and cocaine)	Compromized	Diabetes mellitus	ceftazidime and vancomycin	IV penicillin G	Cured	Latifi et al., 2019
Lactobacillus	*L. rhamnosus*	Not specified	Endocarditis	Endocarditis	Male	74	United States	diabetes mellitus, multi-vessel coronary artery disease status post-coronary artery bypass graft and bio-prosthetic aortic valve replacement (AVR) for severe aortic stenosis. history of probiotic use	Compromized	Diabetes mellitus	ampicillin-sulbactam vancomycin	penicillin	Cured	Zeba et al., 2018
Lactobacillus	*L. gasseri*	Maldi-Tof	Liver abscess	Organ failure	Male	59	Mexico	history of open cholecystectomy (2013), acute necrotizing pancreatitis, complicated with pancreatic fistula, distal pancreatectomy, splenectomy, and pancreaticojejunal anastomosis (2014), causing type 3C DM (2016) and adhesive small bowel occlusion (2017)	Compromized	Metabolism disorder / Organ failure	intravenous meropenem and vancomycin	intravenous penicillin G	Cured	Ramos-Coria et al., 2021
Lactobacillus	*Lactobacillus spp.*	Not specified	Liver abscess and bacteraemia	Organ failure	Female	82	United States	Diabetes mellitus. 2 week course of metronidazole and probiotics containing lactobacilli following C. diff infzction	Compromized	Diabetes mellitus	imipenem and vancomycin		Cured	Sherid et al., 2016

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Appendix – Case reports Opportunistic Infections – *Bifidobacterium* genus

Academic Year 2020/2021

GENRE	Organism	Identification	Clinical Diagnosis	SEPSIS	Sexe	Age (NUM)	Pays	Details (Risk Factor & Predisposing causes, Source of isolation)	Immunostatus	RISK FACTOR	Antibiotherapy : 1st Line	Antibiotherapy : 2nd Line	Outcome	Reference
Bifidobacterium	*B. adolescentis*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Bifidobacterium	*B. adolescentis*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Bifidobacterium	*B. adolescentis*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Bifidobacterium	*B. dentium*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Bifidobacterium	*Bifidobacterium spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Bifidobacterium	*Bifidobacterium spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Bifidobacterium	*Bifidobacterium spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Bifidobacterium	*Bifidobacterium spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Cured	Brook and Frazier, 1993
Bifidobacterium	*B. adolescentis*	Microbiological phenotype	Peritonitis due to diverticulosis	Abscess	Female	60	United States	Fever	Competent	Wound and/or Invasive procedure			Death	Bourne et al., 1978
Bifidobacterium	*B. dentium*	Microbiological phenotype	Bowel obstruction due to rectal cancer	Bacteraemia / Septicaemia	Male	58	United States	Shaking chills. Rectal Cancer	Compromized	Immunodeficiency			Death	Bourne et al., 1978
Bifidobacterium	*B. dentium*	Microbiological phenotype	Fever 1 day post cholecystectomy	Bacteraemia / Septicaemia	Female	39	United States	Fever. Cholecystectomy	Competent	Wound and/or Invasive procedure			Cured	Bourne et al., 1978
Bifidobacterium	*B. dentium*	Microbiological phenotype	Fever 2 days post c section - uterine fibroids	Bacteraemia / Septicaemia	Female	35	United States	Fever. Section of uterine fibroids	Competent	Wound and/or Invasive procedure			Cured	Bourne et al., 1978
Bifidobacterium	*B. dentium*	Microbiological phenotype	Septic chock 5 days postpartum	Bacteraemia / Septicaemia	Female	29	United States	Chills, fever, pregnancy	Compromized	Immunodeficiency			Cured	Bourne et al., 1978
Bifidobacterium	*B. dentium*	Microbiological phenotype	Septic pregnancy	Bacteraemia / Septicaemia	Female	21	United States	Chills, fever, pregnancy	Compromized	Immunodeficiency			Cured	Bourne et al., 1978
Bifidobacterium	*Bifidobacterium spp.*	Microbiological phenotype	Delivery	Bacteraemia / Septicaemia	Female	24	United States	Fever, Pregnancy	Compromized	Immunodeficiency			Cured	Bourne et al., 1978
Bifidobacterium	*Bifidobacterium spp.*	Microbiological phenotype	Fever 2 days postpartum	Bacteraemia / Septicaemia	Female	31	United States	Fever, Pregnancy	Compromized	Immunodeficiency			Cured	Bourne et al., 1978
Bifidobacterium	*Bifidobacterium spp.*	Microbiological phenotype	Multiple Staph. Abscesses	Abscess	Female	34	United States	Subacute bacterial endocarditis	Competent	Polymicrobial Infection			Cured	Bourne et al., 1978
Bifidobacterium	*B. breve*	Microbiological phenotype	Meningitis	Organ failure	Male	0	Japan	Baby, 37 days old. Mother had Behcet's disease.	Compromized	Immunodeficiency			Cured	Hata et al., 1988
Bifidobacterium	*B. adolescentis*	Microbiological phenotype	55 of 57 cases were polymicrobial. 11 patients had unde	Abscess	Not specified	Not specified	United States	Most isolates were from chronic otitis media, abcesses or peritonitis	Competent	Wound and/or Invasive procedure			Cured	Brook, 1996
Bifidobacterium	*B. adolescentis*	Microbiological phenotype	55 of 57 cases were polymicrobial. 11 patients had unde	Abscess	Not specified	Not specified	United States	Most isolates were from chronic otitis media, abcesses or peritonitis	Competent	Wound and/or Invasive procedure			Cured	Brook, 1996
Bifidobacterium	*B. adolescentis*	Microbiological phenotype	55 of 57 cases were polymicrobial. 11 patients had unde	Abscess	Not specified	Not specified	United States	Most isolates were from chronic otitis media, abcesses or peritonitis	Competent	Wound and/or Invasive procedure			Cured	Brook, 1996
Bifidobacterium	*B. adolescentis*	Microbiological phenotype	55 of 57 cases were polymicrobial. 11 patients had unde	Abscess	Not specified	Not specified	United States	Most isolates were from chronic otitis media, abcesses or peritonitis	Competent	Wound and/or Invasive procedure			Cured	Brook, 1996
Bifidobacterium	*B. adolescentis*	Microbiological phenotype	55 of 57 cases were polymicrobial. 11 patients had unde	Abscess	Not specified	Not specified	United States	Most isolates were from chronic otitis media, abcesses or peritonitis	Competent	Wound and/or Invasive procedure			Cured	Brook, 1996
Bifidobacterium	*B. adolescentis*	Microbiological phenotype	55 of 57 cases were polymicrobial. 11 patients had unde	Abscess	Not specified	Not specified	United States	Most isolates were from chronic otitis media, abcesses or peritonitis	Competent	Wound and/or Invasive procedure			Cured	Brook, 1996
Bifidobacterium	*B. adolescentis*	Microbiological phenotype	55 of 57 cases were polymicrobial. 11 patients had unde	Abscess	Not specified	Not specified	United States	Most isolates were from chronic otitis media, abcesses or peritonitis	Competent	Wound and/or Invasive procedure			Cured	Brook, 1996
Bifidobacterium	*B. adolescentis*	Microbiological phenotype	55 of 57 cases were polymicrobial. 11 patients had unde	Abscess	Not specified	Not specified	United States	Most isolates were from chronic otitis media, abcesses or peritonitis	Competent	Wound and/or Invasive procedure			Cured	Brook, 1996
Bifidobacterium	*B. adolescentis*	Microbiological phenotype	55 of 57 cases were polymicrobial. 11 patients had unde	Abscess	Not specified	Not specified	United States	Most isolates were from chronic otitis media, abcesses or peritonitis	Competent	Wound and/or Invasive procedure			Cured	Brook, 1996
Bifidobacterium	*B. adolescentis*	Microbiological phenotype	55 of 57 cases were polymicrobial. 11 patients had unde	Abscess	Not specified	Not specified	United States	Most isolates were from chronic otitis media, abcesses or peritonitis	Competent	Wound and/or Invasive procedure			Cured	Brook, 1996
Bifidobacterium	*B. adolescentis*	Microbiological phenotype	55 of 57 cases were polymicrobial. 11 patients had unde	Abscess	Not specified	Not specified	United States	Most isolates were from chronic otitis media, abcesses or peritonitis	Competent	Wound and/or Invasive procedure			Cured	Brook, 1996
Bifidobacterium	*B. adolescentis*	Microbiological phenotype	55 of 57 cases were polymicrobial. 11 patients had unde	Abscess	Not specified	Not specified	United States	Most isolates were from chronic otitis media, abcesses or peritonitis	Competent	Wound and/or Invasive procedure			Cured	Brook, 1996
Bifidobacterium	*B. adolescentis*	Microbiological phenotype	55 of 57 cases were polymicrobial. 11 patients had unde	Abscess	Not specified	Not specified	United States	Most isolates were from chronic otitis media, abcesses or peritonitis	Competent	Wound and/or Invasive procedure			Cured	Brook, 1996
Bifidobacterium	*B. adolescentis*	Microbiological phenotype	55 of 57 cases were polymicrobial. 11 patients had unde	Abscess	Not specified	Not specified	United States	Most isolates were from chronic otitis media, abcesses or peritonitis	Competent	Wound and/or Invasive procedure			Cured	Brook, 1996
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Bifidobacterium	*B. dentium*	Microbiological phenotype	55 of 57 cases were polymicrobial. 11 patients had unde	Abscess	Not specified	Not specified	United States	Most isolates were from chronic otitis media, abcesses or peritonitis	Competent	Wound and/or Invasive procedure			Cured	Brook, 1996
Bifidobacterium	*B. dentium*	Microbiological phenotype	55 of 57 cases were polymicrobial. 11 patients had unde	Abscess	Not specified	Not specified	United States	Most isolates were from chronic otitis media, abcesses or peritonitis	Competent	Wound and/or Invasive procedure			Cured	Brook, 1996
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GENRE	Organism	Identification	Clinical Diagnosis	SEPSIS	Sexe	Age (NUM)	Pays	Details (Risk Factor & Predisposing causes, Source of isolation)	Immunostatus	RISK FACTOR	Antibiotherapy : 1st Line	Antibiotherapy : 2nd Line	Outcome	Reference
Bifidobacterium	*Bifidobacterium spp.*	Microbiological phenotype	55 of 57 cases were polymicrobial. 11 patients had unde	Abscess	Not specified	Not specified	United States	Most isolates were from chronic otitis media, abcesses or peritonitis	Competent	Wound and/or Invasive procedure			Cured	Brook, 1996
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Bifidobacterium	*Bifidobacterium spp.*	Microbiological phenotype	55 of 57 cases were polymicrobial. 11 patients had unde	Abscess	Not specified	Not specified	United States	Most isolates were from chronic otitis media, abcesses or peritonitis	Competent	Wound and/or Invasive procedure			Cured	Brook, 1996
Bifidobacterium	*Bifidobacterium spp.*	Microbiological phenotype	55 of 57 cases were polymicrobial. 11 patients had unde	Abscess	Not specified	Not specified	United States	Most isolates were from chronic otitis media, abcesses or peritonitis	Competent	Wound and/or Invasive procedure			Cured	Brook, 1996
Bifidobacterium	*B. longum*	Microbiological phenotype	Septicaemia	Bacteraemia / Septicaemia	Male	19	Korea	Acupuncture.	Competent	Wound and/or Invasive procedure			Cured	Ha et al., 1999
Bifidobacterium	*Bifidobacterium spp.*	Microbiological phenotype	Infected tumour	Abscess	Male	67	Taïwan	Cavitating lung tumour.	Competent	Immunodeficiency			Cured	Liao et al., 2000
Bifidobacterium	*B. dentium*	Not specified	Pulmonary infection	Organ failure	Male	52	United States	Alcoholic, dental caries, pyorrhoea.	Compromized	Dental work			Death	Green, 1978
Bifidobacterium	*B. breve*	Gas liquid chromatography	Neonatal meningitis	Organ failure	Male	0	Japan	38w gestation	Compromized	Immunodeficiency			Cured	Nakazawa et al., 1996
Bifidobacterium	*B. dentium*	Microbiological phenotype	Peritonsillar abscess	Abscess	Male	45	United States	Dilated cardiomyopathy, hypertension, alcohol and cocaine abuse.	Compromized	Wound and/or Invasive procedure			Cured	Civen et al., 1993
Bifidobacterium	*Bifidobacterium spp.*	Microbiological phenotype	Spinal epidural abcess	Abscess	Female	57	United Kingdom	Undergone diagnostic discography; 5 days prior. Co infection Streptococcus milleri	Compromized	Polymicrobial Infection			Cured	Cryan et al., 1991
Bifidobacterium	*B. dentium*	Microbiological phenotype	Lung infection	Organ failure	Male	33	United States	Caries, gingivitis and a history of smoking.	Compromized	Dental work			Cured	Thomas et al., 1974
Bifidobacterium	*B. dentium*	Microbiological phenotype	Septicaemia	Bacteraemia / Septicaemia	Male	Not specified	United States	Pleural Empyema	Competent	Wound and/or Invasive procedure			Not specified	Georg et al. 1965
Bifidobacterium	*B. dentium*	Microbiological phenotype	Septicaemia	Bacteraemia / Septicaemia	Female	47	United States	Abscess	Competent	Wound and/or Invasive procedure			Not specified	Georg et al. 1965
Bifidobacterium	*B. dentium*	Microbiological phenotype	Septicaemia	Bacteraemia / Septicaemia	Male	Not specified	United States	Lung abscess	Competent	Wound and/or Invasive procedure			Not specified	Georg et al. 1965
Bifidobacterium	*B. dentium*	Microbiological phenotype	Septicaemia	Bacteraemia / Septicaemia	Female	Not specified	United States	Intramuscular abscess	Competent	Wound and/or Invasive procedure			Not specified	Georg et al. 1965
Bifidobacterium	*B. dentium*	Microbiological phenotype	Septicaemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Metastatic tumor in chest	Compromized	Immunodeficiency			Not specified	Georg et al. 1965
Bifidobacterium	*B. dentium*	Microbiological phenotype	Septicaemia	Bacteraemia / Septicaemia	Male	37	United States	Not stated.	Not stated.	Not stated.			Cured	Georg et al. 1965
Bifidobacterium	*Bifidobacterium spp.*	Microbiological phenotype	Intraabdominal	Abscess	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Not specified	Thirumoorthi et al. 1976
Bifidobacterium	*Bifidobacterium spp.*	Microbiological phenotype	Soft tissues	Abscess	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Not specified	Thirumoorthi et al. 1976
Bifidobacterium	*Bifidobacterium spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Not specified	Thirumoorthi et al. 1976
Bifidobacterium	*Bifidobacterium spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.			Not specified	Thirumoorthi et al. 1976
Bifidobacterium	*B. breve*	RAPD	Septocaemia	Bacteraemia / Septicaemia	Female	0	Japan	Omphalocele, Preterm	Compromized	Immunodeficiency	Ampicillin Sulbactam	Meropenem	Cured	Ohishi et al. 2010
Bifidobacterium	*B. scardovii*	16S RNA sequence clustering	Wound Infection	Abscess	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Mahlen et al. 2009
Bifidobacterium	*B. longum*	16S RNA sequence clustering	Abdominal wound	Abscess	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Mahlen et al. 2009
Bifidobacterium	*B. longum*	16S RNA sequence clustering	Abdominal wound	Abscess	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Mahlen et al. 2009
Bifidobacterium	*B. breve*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Mahlen et al. 2009
Bifidobacterium	*B. breve*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Mahlen et al. 2009
Bifidobacterium	*B. breve*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Mahlen et al. 2009

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Appendix – Case reports Opportunistic Infections – *Lactococcus, Leuconostoc, Weissella* genera

Academic Year 2020/2021

GENRE	Organism	Identification	Clinical Diagnosis	SEPSIS	Sexe	Age (NUM)	Pays	Details (Risk Factor & Predisposing causes, Source of isolation)	Immunostatus	RISK FACTOR	Antibiotherapy : 1st Line	Antibiotherapy : 2nd Line	Outcome	Reference
Lactococcus	*Lc. lactis*	Not specified	Septic arthritis of the hip joint	Organ failure	Female	57	United Kingdom	Consumption of unpasteurized milk					Cured	Campbell et al. 1993
Lactococcus	*Lc. lactis*	Not specified	Endocarditis	Endocarditis	Not specified	Not specified	United Kingdom	Not stated.					Not specified	Clark et al. 1991
Lactococcus	*Lc. lactis*	Not specified	Pneumonia	Organ failure	Male	69	France	Herpes virus infection. Cytomegalovirus and Candida albicans pneumonia. S. aureus pneumonia					Cured	Durand et al. 1995
Lactococcus	*Lc. garviae*	Not specified	Endocarditis	Endocarditis	Female	84	United States	Hypertrophic cardiomyopathy, dual chamber pacemaker. Aortic valve replacement.Hypothyroidism, immune thrombocytopenic purpurea					Death	Fefer et al., 1998
Lactococcus	*Lc. garviae*	Not specified	Endocarditis	Endocarditis	not specified	Not specified	United States	Prosthetic valves	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Not specified	Furutan et al 1991
Lactococcus	*Lc. garviae*	Not specified	Endocarditis	Endocarditis	not specified	Not specified	United States	Prosthetic valves	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Not specified	Furutan et al 1991
Lactococcus	*Lc. garviae*	Not specified	Endocarditis	Endocarditis	not specified	Not specified	United States	Prosthetic valves	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis			Not specified	Furutan et al 1991
Lactococcus	*Lc. garviae*	API (API20Strep)	Osteomyelitis, and possible secondary endocarditis		Female	56	United Kingdom	xenograph aortic valve replacement 12 years earlier					Cured	James et al. 2000
Lactococcus	*Lc. lactis*	Not specified	Endocarditis	Endocarditis	Female	65	United Kingdom	Rh. VD.Ischaemic attack					Cured	Mannion and Rothburn, 1990
Lactococcus	*Lc. garviae*	API (RapidID32 Strep)	Septicaemia	Bacteraemia / Septicaemia	Female	68	France	Immunosuppression					Death	Mofredj et al. 2000
Lactococcus	*Lc. cremoris*	API (ID32Strep)	Liver abscess	Organ failure	Female	14	Japan	Not stated.					Cured	Nakarai et al. 2000
Lactococcus	*Lc. lactis*	Not specified	Liver abscess	Organ failure	Male	40	Belgium	Secondary to appendicitis due to a wire within the appendix					Cured	Paul et al. 1991
Lactococcus	*Lc. cremoris*	API (API20 strep)	Necrotizing pneumonitis and empyema		Male	24	Italy	AIDS. Lymphadenopathy. Drug addiciton					Cured	Torre et al. 1990
Lactococcus	*Lc. cremoris*	Microbiological phenotype	Septicaemia	Bacteraemia / Septicaemia	Male	11	Germany	Congenital pulmonalstenosis					Cured	Handrick et al. 1974
Lactococcus	*Lc. lactis*	Microbiological phenotype	Endocarditis	Endocarditis	Male	21	United States	Systolic murmur of unknown aetiology.Small wounds of gums					Cured	Wood et al., 1955
Lactococcus	*Lc. lactis*	API (API20Strep)	Cerebellar abscess	Abscess	Female	45	Marocco	Dental surgery	Competent	Dental work			Cured	Akhaddar et al. 2002
Lactococcus	*Lc. cremoris*	API (API20 strep)	Endocarditis	Endocarditis	Male	67	Iceland	Probable pericarditis, 33 years prior.None					Cured	Halldorsdottir et al., 2002
Lactococcus	*Lc. cremoris*	Not specified	Peritonitis	Abscess	Male	67	Belgium	Nephroangiosclerosis					Cured	Mat et al. 2003
Lactococcus	*Lc. cremoris*	API (ID32Strep)	Liver abscess	Organ failure	Female	79	Spain	Fever, diarrhoea, asthenia and anorexia.					Cured	Antolin et al., 2004
Lactococcus	*Lc. cremoris*	Not specified	General aneurysmatosis	Organ failure	Male	49	Germany	Cardiac murmur. Endocarditis. Aortic valve replacement					Cured	Resch et al. 2007
Lactococcus	*Lc. garviae*	Molecular typing	Fever and purpura	Organ failure	Male	72	Taiwan	Consumption of raw fish. Gastric ulcer					Cured	Wang et al. 2007
Lactococcus	*Lc. garviae*	Molecular typing	Multiple organ failure	Organ failure	Male	10	Taiwan	Consumption of raw fish. Oesophagal reconstruction					Death	Wang et al. 2007
Lactococcus	*Lc. garviae*	Molecular typing	Suprapubic pain and fever	Organ failure	Female	56	Taiwan	Small bowel diverticulosis					Cured	Wang et al. 2007
Lactococcus	*Lc. garviae*	Molecular typing	Peritonitis	Abscess	Male	47	Taiwan	Consumption of raw fish. Small bowel perforation					Cured	Wang et al. 2007
Lactococcus	*Lc. lactis*	BACTEC	Peritonitis	Abscess	Female	46	Turkey	Chronic renal failure. CAPD.					Cured	Guz et al. 2006
Lactococcus	*Lc. cremoris*	Microbiological phenotype	Deep neck infection	Organ failure	Male	68	Turkey	Buccal mucosa tumor and consumption of unpasteurised milk.					Cured	Koyuncu et al., 2005
Lactococcus	*Lc. cremoris*	API (API 20Strep)	Endocarditis	Endocarditis	Male	56	Italy	mild chronic glomerulonephritis and chronic outy arthritis					Cured	Pellizer et al. 1996
Lactococcus	*Lc. lactis*	Not specified	Liver abscess	Organ failure	Male	62	Australia	Not stated.					Cured	Denholm et al. 2006
Lactococcus	*Lc. cremoris*	Serotyping	Endocarditis	Endocarditis	Male	41	Germany	acute appendicitis					Death	Brehmer et al. 1955
Lactococcus	*Lc. lactis*	Not specified	Thrombophlebitis	Organ failure	Male	39	Spain	AIDS, drug addicted					Cured	Monsalvo et al. 2004
Lactococcus	*Lc. cremoris*	API (Rapid ID32 Strep)	Purulent pleurisy	Organ failure	Male	66	France	Alcohol abuse					Cured	Mofredj et al. 2006
Lactococcus	*Lc. cremoris*	API (Rapid ID32 Strep)	Canaliculitis	Organ failure	Female	80	Hong-Kong	Diabetes					Cured	Leung et al. 2006
Lactococcus	*Lc. lactis*	BACTEC	Endocarditis	Endocarditis	Male	55	Italy	Several dental extractions without antibiotic prophylaxis					Cured	Zechini et al. 2006
Lactococcus	*Lc. garviae*	16S RNA sequence clustering	Endocarditis	Endocarditis	Male	41	Taiwan	Acte Cerebral Infarction. Profession Cooker : in contact with raw fish	Competent	Not stated.			Cured	Li et al. 2008
Lactococcus	*Lc. garviae*	PCR Based Identification	Endocarditis	Endocarditis	Male	80	Canada	Type 2 Diabetes Mellitus	Compromized	Diabetes Mellitus			Cured	Vinh et al. 2006
Lactococcus	*Lc. garviae*	16S RNA sequence clustering	Endocarditis	Endocarditis	Female	86	France	Aortic Valve Replacement 6y ago and Cholecystectomy 8y ago	Compromized	Immunodeficiency			Cured	Fihman et al. 2006
Lactococcus	*Lc. cremoris*	Bactec	Endocarditis	Endocarditis	Male	41	Taiwan	Not stated.	Not stated.	Not stated.	Penicillin		Death	Lin et al. 2010
Lactococcus	*Lc. lactis*	ADN 16S RNA	Bacteraemia	Bacteraemia / Septicaemia	Female	1	Israël	Neonatal Intensive Care unit. Preterm 26w	Compromized	Immunodeficiency	Cefotaxime and Vancomycine		Cured	Glikman et al. 2010
Lactococcus	*Lc. cremoris*		Cholangitis	Organ failure	Female	72	United Kingdom	Not stated.	Competent	Not stated.			Cured	Davies et al. 2009
Lactococcus	*Lc. cremoris*	Rapid ID32C	Liver abscess and Empyema	Abscess	Male	42	Korea		Competent	Not stated.	Cetotaxime and Levofloxacin		Cured	Kim et al. 2010
Lactococcus	*Lc. Lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactococcus	*Lc. Lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactococcus	*Lc. Lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactococcus	*Lc. Lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactococcus	*Lc. Lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactococcus	*Lc. Lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactococcus	*Lc. Lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactococcus	*Lc. Lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactococcus	*Lc. Lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactococcus	*Lc. Lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactococcus	*Lc. Lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactococcus	*Lc. Lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactococcus	*Lc. Lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactococcus	*Lc. Lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactococcus	*Lc. Lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Lactococcus	*Lc. Lactis*	Microbiological phenotype	Endocarditis	Endocarditis	Female	Not specified	Poland	Pregnancy	Compromized	Immunodeficiency	not specified	not specified	Not specified	Galinski et al. 1966
Lactococcus	*Lc. Lactis*	Microbiological phenotype	Meningitis & Septicemia	Bacteraemia / Septicaemia	Female	0	Japan	Neonate, low birth weight	Compromized	Immunodeficiency	vancomycine and cefotaxime		Cured	Uchida et al. 2011
Lactococcus	*Lactococcus spp.*	Microbiological phenotype	Osteomyelitis	Organ failure	Not specified	Not specified	Hungary	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Kiss et al. 2005
Lactococcus	*Lc. garviae*	Not specified	Endocarditis	Endocarditis	Male	55	Germany	History of heart disease	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis	Gentamicin, vancomycin, rifampicin	levofloxacin, amoxicillin, clavulanic acid	Cured	Wilbring et al. 2011

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Lactococcus	*Lc. garviae*	16S RNA sequence clustering	Spondylodiscitis	Abscess	Male	70	China	Long standing gastritis	Competent	Metabolism disorder / Organ failure	Ampicillin		Cured	Chan et al. 2011
Lactococcus	*Lc. garviae*	Not specified	Endocarditis	Endocarditis	Male	67	China	Chronic Rheumatic Heart Disease	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis	Ampicillin		Cured	Yiu et al. 2007
Lactococcus	*Lc. garviae*	16S RNA sequence clustering	Endocarditis	Endocarditis	Female	64	France	Rheumatoid Mitral Stenosis, Pacemaker implantation 10y before	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis	Amoxicillin and Gentamicin		Cured	Zuily et al. 2011
Lactococcus	*Lc. Lactis*	BACTEC	Liver abscess	Abscess	Male	26	Turkey	Biliary tract anormality	Competent	Metabolism disorder / Organ failure	Teicoplanin and Metrodinazole	Meropenem	Cured	Güz et al. 2006
Lactococcus	*Lc. Lactis*	API (API 20Strep)	Necrotizing pneumonia		Male	70	Spain		Competent	history of arterial hypertension and lacunar stroke	amoxicillin-clavulanic acid	moxifloxacin	Cured	Buchelli-Ramirez et al., 2013
Leuconostoc	*Leuconostoc spp.*	API (API20 strep)	Septicaemia	Bacteraemia / Septicaemia	Female	1	Sweden	Short-bowel syndrome, CVC, parenteral nutrition.					Cured	Monsen et al. 1997
Lactococcus	*Lc. Lactis*		Septicaemia	Bacteraemia / Septicaemia				Catheter in place						Glikman et al., 2010
Lactococcus	*Lc. Lactis*		Bacterial meningitis and septicemia	Bacteraemia / Septicaemia	Male	1	Japan							Uchida et al., 2011
Lactococcus	*Lc. garviae*		Septicaemia	Bacteraemia / Septicaemia	Male	75	Slovenia	prosthetic heart valves with a septicaemia without infective endocarditis					Cured	Nadrah et al., 2011
Lactococcus	*Lc. garviae*	Biochemical Tests	Endocarditis	Endocarditis	Female	58	Brazil	metallic prosthetic heart valve		metallic prosthetic heart valve			Cured	Hirakawa et., 2011
Lactococcus	*Lc. garviae*				Female	83	Denmark				ampicillin and ciprofloxacin		Cured	Fog Moller et al., 2012
Lactococcus	*Lc. cremoris*		Spondylodiscitis and Endocarditis	Endocarditis	Female	68	Tunisia				ofloxacine, gentamycine		Cured	Saidan et al, 2013
Lactococcus	*Lc. Lactis*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Male	1	Turkey	Hirschprung's disease (HD) who developed a catheter-related bloodstream infection	Compromized	Catheter	Vancomycin		Cured	Karaaslan et al., 2014
Lactococcus	*Lc. Lactis*	Maldi-Tof	Cholangitis and Bacteraemia	Bacteraemia / Septicaemia	Male	70	Japan	cholangiocarcinoma	Compromized	Compromized				Shimizu et al., 2019
Lactococcus	*Lc. garviae*		Bacteraemia	Bacteraemia / Septicaemia	Male	86	United States	long-term gastrostomy feeding tube in situ for enteral feeding	Compromized	Poor hygiene in the enteral feeding (cross contamination)	e ampicillin and ceftazidime		Cured	Sahu et al., 2019
Lactococcus	*Lc. Lactis*		Bacteraemia	Bacteraemia / Septicaemia	Female	59	United States	Probiotic Supplementation Therapy			Ertapenem, Amoxicillin		Cured	Gurley et al., 2021
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Retroaerolar breast abscess	Organ failure	Female	17	Ireland	Duct ectasia					Cured	Barry et al. 1993
Leuconostoc	*Leuc. citreum*	Microbiological phenotype	Septicaemia	Bacteraemia / Septicaemia	Female	0	Spain	Two episodes of catheter infection by Staphylococcus epidermidis					Cured	Bernarldo de Quiros et al. 1991
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Not specified	Not specified	Male	72	Spain	Acute myocardial infarction.					Death	Bernarldo de Quiros et al. 1991
Leuconostoc	*Leuconostoc spp.*	API (APIStrep)	Pleural empyema	Organ failure	Female	46	Israel	2 admissions for pneumonia					Cured	Borer et al. 1997
Leuconostoc	*Leuc. pseudomesenteroides*	Microbiological phenotype	Urinary tract infection	Organ failure	Male	16	Brazil	Hydrocephalus and prolonged hospital stay					Death	Cappelli et al. 1999
Leuconostoc	*Leuc. pseudomesenteroides*	Microbiological phenotype	Urinary tract infection	Organ failure	Male	29	Brazil	Asthma, Alcoholism and drug addiction					Cured	Cappelli et al. 1999
Leuconostoc	*Leuc. pseudomesenteroides*	Microbiological phenotype	Urinary tract infection	Organ failure	Female	14	Brazil	Renal transplantation and prolonged hospital stay					Cured	Cappelli et al. 1999
Leuconostoc	*Leuc. pseudomesenteroides*	Microbiological phenotype	Urinary tract infection	Organ failure	Female	18	Brazil	Endometriosis and prolonged hospital stay					Cured	Cappelli et al. 1999
Leuconostoc	*Leuc. pseudomesenteroides*	Microbiological phenotype	Urinary tract infection	Organ failure	Female	37	Brazil	Not stated.					Cured	Cappelli et al. 1999
Leuconostoc	*Leuc. lactis*	Not specified	Fever and vomiting	Organ failure	Male	4	Australia	Small bowel resection at birth for malrotation with volvulus. Infection came from the enteral formula taken by catheter.					Cured	Carapetis et al. 1994
Leuconostoc	*Leuc. pseudomesenteroides*	Not specified	Fever	Organ failure	Female	2	Australia	Short bowel syndrom (necrotizing enterocolitis at birth)					Cured	Carapetis et al. 1994
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	0	United States	Short Gut Syndrom					Death	Dhodapkar et al. 1996
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Hepatic necrosis following hepatic artery ligation	Organ failure	Male	44	United States	Liver transplantation. Immunosuppression					Death	Espinoza et al. 1997
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Meningitis	Organ failure	Female	0	South Africa	Hirschprung's disease. Defunctioning colostomy.					Death	Friedland et al. 1990
Leuconostoc	*Leuc. citreum*	Microbiological phenotype	Pneumonia	Organ failure	Male	33	Italy	AIDS					Death	Giacometti et al. 1993
Leuconostoc	*Leuc. mesenteroides*	Not specified	Septicaemia	Bacteraemia / Septicaemia	Not specified	0	Australia	32w gestation					Cured	Golledge et al. 1991
Leuconostoc	*Leuc. paramesenteroides*	Not specified	Septicaemia	Bacteraemia / Septicaemia	Not specified	0	Australia	28w gestation					Death	Golledge et al. 1991
Leuconostoc	*Leuc. mesenteroides*	Microbiological phenotype	Fever, bacteraemia	Bacteraemia / Septicaemia	Female	78	United States	chronic renal failure					Cured	Handwerger et al. 1990
Leuconostoc	*Leuc. paramesenteroides*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	53	United States	alcohol abuse, candidal esophagitis, erosive gastritis					Cured	Handwerger et al. 1990
Leuconostoc	*Leuc. paramesenteroides*	Microbiological phenotype	Fever, bacteraemia	Bacteraemia / Septicaemia	Male	0	United States	Urinary tract infection, S. aureus bacteraemia					Cured	Handwerger et al. 1990
Leuconostoc	*Leuc. paramesenteroides*	Microbiological phenotype	Respiratory infection	Organ failure	Male	22	United States	Intravenous drug abuse, AIDS					Death	Handwerger et al. 1990
Leuconostoc	*Leuc. paramesenteroides*	Microbiological phenotype	Neutropenia	Organ failure	Male	9	United States	Acute lymphocytic leukaemia					Cured	Handwerger et al. 1990
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	75	United States	history o rhumatoid arthritis and petic ulcer disease					Cured	Handwerger et al. 1990
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Septicaemia	Bacteraemia / Septicaemia	Female	0	United States	26w gestation. Twins (740g)					Cured	Hardy et al., 1988
Leuconostoc	*Leuconostoc spp.*	API (API 50CHL)	Bacteraemia	Bacteraemia / Septicaemia	Not specified	0	United States	CVC. Staphylococcus epidermidis associated bacteraemia					Cured	Isenberg et al. 1988
Leuconostoc	*Leuc. cremoris*	API (API 50CH)	Bacteramia	Bacteraemia / Septicaemia	Male	31	Spain	Burns 45% of the body surface					Cured	Jimenez-Mejias et al. 1997
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	Not specified	Singapore	Endstage renal failure with AV fistula abscess					Cured	Ling et al. 1992
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	78	Singapore	Chronic renal failure, diabetes mellitus with broncho pneumonia					Cured	Ling et al. 1992
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	66	Singapore	Diabetes mellitus, liver diseases with V. vulnificus septicemia					Cured	Ling et al. 1992
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	73	Singapore	Diabetes mellitus with chronic osteomyelitis					Cured	Ling et al. 1992
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	65	Singapore	Right lowerlobe pneumonia					Cured	Ling et al. 1992
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	45	Singapore	Lefort II facture					Cured	Ling et al. 1992
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	23	Singapore	Asthma with right pneumonia					Cured	Ling et al. 1992
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	0	Singapore	Prematurity with PDA					Cured	Ling et al. 1992
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	26	Singapore	Steven Johnson's syndrome					Cured	Ling et al. 1992
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	0	Singapore	Viral fever with cutaneous candidiasis					Cured	Ling et al. 1992

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Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	66	Singapore	Chronic obstructive pulmonary disease					Cured	Ling et al. 1992
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Abdominal wall abscess	Organ failure	Female	58	Spain	Liver transplant					Cured	Montejo et al. 2000
Leuconostoc	*Leuc. mesenteroides*	API Rapid Step System	Bacteraemia	Bacteraemia / Septicaemia	Female	0	United States	Small bowel resection at birth for malrotation with congenital jejunal atresias					Cured	Noriega et al., 1990
Leuconostoc	*Leuc. cremoris*	Microbiological phenotype	Septicaemia	Bacteraemia / Septicaemia	Male	32	Spain	AIDS. Lymphome de Hodgkin					Death	Nozal Nalda et al. 1997
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	2	United States	AIDS. Pneumocystis pneumonia					Cured	Peters et al. 1992
Leuconostoc	*Leuc. pseudomesenteroides*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	60	Spain	Acute mieloblastic leukaemia.					Cured	Rodriguez et al., 1999
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	0	United States	Necrotizing enterocolitis requiring resection of small bowell					Cured	Rubin et al. 1988
Leuconostoc	*Leuconostoc spp.*	BACTEC	Surgical site abscess	Organ failure	Female	62	Italy	Previous Billroth gastrectomy					Cured	Scano et al. 1999
Leuconostoc	*Leuconostoc spp.*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Female	62	Italy	Mediastinum perfored during oesophageal endoscopy					Cured	Scano et al. 1999
Leuconostoc	*Leuconostoc spp.*	BACTEC	Surgical site abscess	Organ failure	Female	61	Italy	Breast cancer					Cured	Scano et al. 1999
Leuconostoc	*Leuc. mesenteroides*	Microbiological phenotype	Endocarditis	Endocarditis	Female	72	Spain	Prosthetic aortic valve					Death	Vazquez et al., 1998
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Odontogenic infection	Organ failure	Male	58	United States	Not stated.					Cured	Wenocur et al. 1988
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Fever and Septicaemia	Bacteraemia / Septicaemia	Female	16	South Africa	Not stated.					Cured	Coovadia et al. 1987
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Gastroenteritis, Ileus	Organ failure	Female	0	South Africa	Not stated.					Cured	Coovadia et al. 1988
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Not specified	Not specified	Male	0	South Africa	newborn preterm					Cured	Coovadia et al. 1988
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Tachycardia, Right chest pneumonia	Organ failure	Male	0	South Africa	1 week history of cough, dyspnoea, loss of appetite, vomiting					Cured	Coovadia et al. 1988
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	0	South Africa	Diarrhea					Death	Coovadia et al. 1988
Leuconostoc	*Leuc. dextranicum*	API (API20Strep)	Septicaemia	Bacteraemia / Septicaemia	Male	40	France	Coma. Left sided hemiplegia. Tracheotomy					Cured	Buu Hoï et al. 1985
Leuconostoc	*Leuconostoc spp.*	API (APIStaph)	Septicaemia	Bacteraemia / Septicaemia	Female	36	France	Systemic lupus erythematosus treated for five years by corticosteroid therapy					Death	Buu Hoï et al. 1985
Leuconostoc	*Leuc. dextranicum*	API (API20Strep)	Systemic sclerosis	Organ failure	Not specified	Not specified	United Kingdom	Not stated.					Not specified	Dyas et al. 1988
Leuconostoc	*Leuc. mesenteroides*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	78	United States	Haemodialysis					Cured	Horowitz et al. 1987
Leuconostoc	*Leuc. paramesenteroides*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	53	United States	Alcohol abuser with gastrointestinal bleeding					Cured	Horowitz et al. 1987
Leuconostoc	*Leuc. paramesenteroides*	Microbiological phenotype	Sepsi and pneumonia	Bacteraemia / Septicaemia	Male	0	United States	anoxic encephalopathy with aspiration pneumonia					Death	Horowitz et al. 1987
Leuconostoc	*Leuc. cremoris*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	32	Spain	AIDS. Infection of S. pneumoniae					Death	Del Nozal Nalda et al. 1997
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Pneumonia	Organ failure	Male	31	France	2 years before : HLA identical allogeneic BMT for acute myeloblastic leukaemia					Death	Giraud et al. 1993
Leuconostoc	*Leuconostoc spp.*	API (API 20Strep)	Endocarditis	Endocarditis	Female	64	Australia	Prolasting mitral valve leaflet					Cured	Golledge et al. 1989
Leuconostoc	*Leuc. mesenteroides*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	22	United States	Immunosuppression					Cured	Riebel and Washington, 1990
Leuconostoc	*Leuc. mesenteroides*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	65	United States	Prosthetic hip surgery					Cured	Riebel and Washington, 1990
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Gastrostomy site	Organ failure	Female	56	United States	Not stated.					Cured	Ruoff et al., 1988
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Gastrostomy site	Organ failure	Male	75	United States	Not stated.					Cured	Ruoff et al., 1988
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Tracheostomy site	Organ failure	Male	83	United States	Not stated.					Cured	Ruoff et al., 1988
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Not specified	Not specified	Not specified	Not specified	United States	Not stated.					Not specified	Ruoff et al., 1988
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Not specified	Not specified	Not specified	Not specified	United States	Not stated.					Not specified	Ruoff et al., 1988
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Not specified	Not specified	Not specified	Not specified	United States	Not stated.					Not specified	Ruoff et al., 1988
Leuconostoc	*Leuc. pseudomesenteroides*	BACTEC	Bacteraemia	Bacteraemia / Septicaemia	Male	60	Spain	Previous gastrectomy and splenectomy					Cured	Martinez-Martinez et al. 1992
Leuconostoc	*Leuconostoc spp.*	Not specified	Low grad fever and mild dyspnea	Organ failure	Male	31	Spain	HIV Infection. Heroin addict. Pneumonia episodes before admittance.					Cured	Ferrer et al. 1998
Leuconostoc	*Leuc. mesenteroides*	PFGE	Septicaemia	Bacteraemia / Septicaemia	Female	18	United States	Hodgkin's lymphoma					Cured	Golan et al. 2001
Leuconostoc	*Leuc. mesenteroides*	PFGE	Septicaemia	Bacteraemia / Septicaemia	Male	35	United States	Acute myeloblastic leukaemia					Death	Golan et al. 2001
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Peritonitis	Abscess	Female	7	United States	Bacteraemia with staphylococcus					Cured	Gillespie et al. 2002
Leuconostoc	*Leuconostoc spp.*	API (API Rapid ID32 Strep)	Osteomyelitis	Organ failure	Male	16	Australia	Not stated.					Cured	Mulford et al. 1999
Leuconostoc	*Leuconostoc spp.*	Latex agglutination	Fever	Organ failure	Female	0	Spain	Four day history of cough and fever before admittance					Cured	Casanova-Roman et al. 2001
Leuconostoc	*Leuconostoc spp.*	Not specified	Hyperleucocytosis	Organ failure	Female	91	France	Gastric adenocarcinoma with hepatic metastasis					Cured	Fauchais et al. 2003
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacterial peritonitis and bacteraemia	Bacteraemia / Septicaemia	Male	61	United States	history f type II diabetes mellitus and cryptogenic cirrhosis					Death	Templin et al. 2001
Leuconostoc	*Leuc. lactis*	Not specified	Subarachnoid hemorrhage and acute hydrocephalus	Organ failure	Male	50	United States	ventricular shunt placement after embolization of a CNS arteriovenous malformation					Cured	Deye et al. 2003
Leuconostoc	*Leuc. Lactis*	Crystal ID	Liver abscess	Organ failure	Male	52	Greece	Type II diabetes mellitus					Cured	Vagiakoou-Voudris et al. 2002
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	1	Saudi Arabia	Short gut Syndrom					Cured	Helali et al. 2005
Leuconostoc	*Leuconostoc spp.*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.					Not specified	Sullivan et al. 2006
Leuconostoc	*Leuconostoc spp.*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.					Not specified	Sullivan et al. 2006
Leuconostoc	*Leuc. mesenteroides*	Microbiological phenotype	Urinary tract infection	Organ failure	Not specified	Not specified	India	Nosocomial transmission					Cured	Taneja et al. 2005
Leuconostoc	*Leuc. mesenteroides*	Microbiological phenotype	Urinary tract infection	Organ failure	Not specified	Not specified	India	Nosocomial transmission					Cured	Taneja et al. 2005
Leuconostoc	*Leuc. mesenteroides*	Microbiological phenotype	Urinary tract infection	Organ failure	Not specified	Not specified	India	Nosocomial transmission					Cured	Taneja et al. 2005
Leuconostoc	*Leuc. mesenteroides*	Microbiological phenotype	Urinary tract infection	Organ failure	Not specified	Not specified	India	Nosocomial transmission					Cured	Taneja et al. 2005
Leuconostoc	*Leuc. mesenteroides*	Microbiological phenotype	Urinary tract infection	Organ failure	Not specified	Not specified	India	Nosocomial transmission					Cured	Taneja et al. 2005
Leuconostoc	*Leuc. mesenteroides*	Microbiological phenotype	Urinary tract infection	Organ failure	Not specified	Not specified	India	Nosocomial transmission					Cured	Taneja et al. 2005
Leuconostoc	*Leuc. mesenteroides*	Microbiological phenotype	Urinary tract infection	Organ failure	Not specified	Not specified	India	Nosocomial transmission					Cured	Taneja et al. 2005
Leuconostoc	*Leuc. mesenteroides*	Microbiological phenotype	Urinary tract infection	Organ failure	Not specified	Not specified	India	Nosocomial transmission					Cured	Taneja et al. 2005
Leuconostoc	*Leuc. mesenteroides*	Microbiological phenotype	Urinary tract infection	Organ failure	Not specified	Not specified	India	Nosocomial transmission					Cured	Taneja et al. 2005
Leuconostoc	*Leuc. mesenteroides*	Microbiological phenotype	Urinary tract infection	Organ failure	Not specified	Not specified	India	Nosocomial transmission					Cured	Taneja et al. 2005
Leuconostoc	*Leuc. mesenteroides*	Microbiological phenotype	Urinary tract infection	Organ failure	Not specified	Not specified	India	Nosocomial transmission					Cured	Taneja et al. 2005
Leuconostoc	*Leuc. mesenteroides*	Microbiological phenotype	Urinary tract infection	Organ failure	Not specified	Not specified	India	Nosocomial transmission					Cured	Taneja et al. 2005
Leuconostoc	*Leuconostoc spp.*	Not specified	Endocarditis	Endocarditis	Male	55	United States	Not stated.					Cured	Starr et al. 2007
Leuconostoc	*Leuc. citreum*	BACT Alert	Bacteraemia	Bacteraemia / Septicaemia	Male	18	Czech republic	Burn Injury 3rd degree					Cured	Svec et al. 2007
Leuconostoc	*Leuc. lactis*	BACT Alert	Bacteraemia	Bacteraemia / Septicaemia	Male	55	Czech republic	Polytraumatism due to car accident					Cured	Svec et al. 2007

GENRE	Organism	Identification	Clinical Diagnosis	SEPSIS	Sexe	Age (NUM)	Pays	Details (Risk Factor & Predisposing causes, Source of isolation)	Immunostatus	RISK FACTOR	Antibiotherapy : 1st Line	Antibiotherapy : 2nd Line	Outcome	Reference
Leuconostoc	*Leuc. lactis*	BACT Alert	Bacteraemia	Bacteraemia / Septicaemia	Female	1	Czech republic	Short Bowel Syndrome					Cured	Svec et al. 2007
Leuconostoc	*Leuc. mesenteroides*	BACT Alert	Bacteraemia	Bacteraemia / Septicaemia	Male	4	Czech republic	Bronchopneumonia					Cured	Svec et al. 2007
Leuconostoc	*Leuc. mesenteroides*	BACT Alert	Bacteraemia	Bacteraemia / Septicaemia	Male	49	Czech republic	Burn Injury 3rd degree					Cured	Svec et al. 2007
Leuconostoc	*Leuc. pseudomesenteroides*	BACT Alert	Bacteraemia	Bacteraemia / Septicaemia	Female	25	Czech republic	Non Hodgkin's lymphoma					Cured	Svec et al. 2007
Leuconostoc	*Leuconostoc spp.*	API (API 20Strep)	Bacteraemia	Bacteraemia / Septicaemia	Male	42	Turkey	Colon adenocarcinoma					Cured	Aygun et al. 2005
Leuconostoc	*Leuconostoc spp.*	API (API 20Strep)	Bacteraemia	Bacteraemia / Septicaemia	Male	26	Turkey	shunt operation because of pineal lesion and hydrocephaly					Cured	Aygun et al. 2005
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteramia	Bacteraemia / Septicaemia	Male	64	Spain	Diabetes mellitus					Cured	Cinza-sanjurjo et al. 2006
Leuconostoc	*Leuc. Lactis*	API (API20Strep)	Osteomyelitis	Organ failure	Male	1	Turkey	Arterial switch operation. S aureus infection					Death	Kocak et al. 2006
Leuconostoc	*Leuconostoc spp.*	Not specified	Osteomyelitis	Organ failure	Male	52	France	20 year history of chronic bilateral idiopathic lymphedema					Cured	Zaoui et al. 2005
Leuconostoc	*Leuc. garlicum*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Female	1	Chile	Short Bowel Syndrome. Intestinal obstruction. Resection of 29cm. Broviac Catheter					Cured	Jofre et al. 2006
Leuconostoc	*Leuconostoc spp.*	API (API20 strep)	Bacteraemia	Bacteraemia / Septicaemia	Female	1	Chile	Short Bowel Syndrome. Broviac Catheter					Cured	Jofre et al. 2006
Leuconostoc	*Leuconostoc spp.*	Not specified	Septicaemia	Bacteraemia / Septicaemia	Not specified	Not specified	China	Brain abscess	Not stated.	Not stated.			Not specified	Wei et al. 2007
Leuconostoc	*Leuc. mesenteroides*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	37	Morocco	Myasthenia	Compromized	Immunodeficiency			Cured	Azendour et al. 2008
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Abdominal wall abscess	Organ failure	Female	44	Colombia	Uterine Carcinoma	Compromized	Immunodeficiency			Death	Cuervo et al. 2008
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	7	Colombia	Leukaemia	Compromized	Immunodeficiency			Cured	Cuervo et al. 2008
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	19	Colombia	Leukaemia	Compromized	Immunodeficiency			Death	Cuervo et al. 2008
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Peritonitis	Abscess	Female	78	Colombia	Adenocarcinoma	Compromized	Immunodeficiency			Death	Cuervo et al. 2008
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Neutropenia	Bacteraemia / Septicaemia	Female	43	Colombia	Cancer.	Compromized	Immunodeficiency			Cured	Cuervo et al. 2008
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	50	Colombia	Multiple myeloma	Compromized	Immunodeficiency			Cured	Cuervo et al. 2008
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	35	Colombia	Adenocarcinoma	Compromized	Immunodeficiency			Cured	Cuervo et al. 2008
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Perianal ulcer	Organ failure	Female	8	Colombia	Leukaemia	Compromized	Immunodeficiency			Cured	Cuervo et al. 2008
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Pneumonia	Organ failure	Male	76	Colombia	Carcinoma	Compromized	Immunodeficiency			Cured	Cuervo et al. 2008
Leuconostoc	*Leuc. lactis*	API 50 CHL	Bacteraemia	Bacteraemia / Septicaemia	Female	3	Spain	Rabdomiosarcome	Compromized	Immunodeficiency			Cured	Jato et al. 2001
Leuconostoc	*Leuconostoc spp.*	PCR Genus specific	Wound	Organ failure	Not specified	Not specified	Thailand	Corneal discharge	Competent	Wound and/or Invasive procedure			Cured	Kulchiwitt et al. 2005
Leuconostoc	*Leuconostoc spp.*	PCR Genus specific	Not specified	Not specified	Not specified	Not specified	Thailand	Ascitic fluid. Suspected chronic liver disease	Compromized	Immunodeficiency			Death	Kulchiwitt et al. 2005
Leuconostoc	*Leuconostoc spp.*	PCR Genus specific	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Thailand	Stroke	Competent	Wound and/or Invasive procedure			Death	Kulchiwitt et al. 2005
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Compromized	Immunodeficiency			Death	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Compromized	Immunodeficiency			Death	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Compromized	Immunodeficiency			Death	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Compromized	Immunodeficiency			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Compromized	Immunodeficiency			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Compromized	Immunodeficiency			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Compromized	Immunodeficiency			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Compromized	Immunodeficiency			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Compromized	Immunodeficiency			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Compromized	Immunodeficiency			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Compromized	Immunodeficiency			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Compromized	Immunodeficiency			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Compromized	Immunodeficiency			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Compromized	Immunodeficiency			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Compromized	Immunodeficiency			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Compromized	Immunodeficiency			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Compromized	Immunodeficiency			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Compromized	Immunodeficiency			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Competent	Wound and/or Invasive procedure			Cured	Bou et al. 2008

GENRE	Organism	Identification	Clinical Diagnosis	SEPSIS	Sexe	Age (NUM)	Pays	Details (Risk Factor & Predisposing causes, Source of isolation)	Immunostatus	RISK FACTOR	Antibiotherapy : 1st Line	Antibiotherapy : 2nd Line	Outcome	Reference
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Not stated.	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Not stated.	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Not stated.	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Not stated.	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Not stated.	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Spain	Enteral / Parenteral Nutrition	Not stated.	Wound and/or Invasive procedure			Cured	Bou et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Brain abscess	Organ failure	Female	61	Italy	Previous sarcoidosis	Compromized	Immunodeficiency			Cured	Albanese et al. 2006
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Male	0	United States	Necrotizing enterocolitis. SBS	Compromized	Immunodeficiency			Cured	Florescu et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Female	11	United States	Midgut volvulus and congenital malrotation. SBS	Compromized	Immunodeficiency			Cured	Florescu et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Male	0	United States	Gastroschisis and Boxel Infarction. SBS	Compromized	Immunodeficiency			Cured	Florescu et al. 2008
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Female	2	United States	Jejunal atresia. SBS	Compromized	Immunodeficiency			Cured	Florescu et al. 2008
Leuconostoc	*Leuconostoc spp.*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Female	4	United States	Gastroschisis. SBS	Compromized	Immunodeficiency			Cured	Florescu et al. 2008
Leuconostoc	*Leuconostoc spp.*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Female	0	United States	Gastroschisis. SBS	Compromized	Immunodeficiency			Cured	Florescu et al. 2008
Leuconostoc	*Leuconostoc spp.*	Not specified	Septicaemia	Bacteraemia / Septicaemia	Female	34	Japan	Acute Myelogenous Leukaemia	Compromized	Immunodeficiency			Death	Yamazaki et al. 2009
Leuconostoc	*Leuconostoc spp.*	API20 Strep	Septicaemia	Bacteraemia / Septicaemia	Female	0	United States	Preterm Neonate (645g). Intravenous central catheter	Competent	Wound and/or Invasive procedure	Vancomycin	Ampicillin and gentamycin	Cured	Janow et al. 2009
Leuconostoc	*Leuconostoc spp.*	Vitek	Meningitis	Organ failure	Female	57	Turkey	Infection occured during follow up of subarachnoid hemorrhage	Not stated.	Not stated.	Dexamethasone, Ceftazidime, Vancomycin	Linezolid	Cured	Ataman Hatipoglu et al. 2009
Leuconostoc	*Leuconostoc spp.*	Not specified	Chronic Postoperative endophthalmitis	Organ failure	Male	43	Australia	Eye operation	Competent	Wound and/or Invasive procedure	Vancomyine & Ceftazydime		Cured	Durkin et al. 2008
Leuconostoc	*L. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Male	72	Spain	CVC in intensive care unit	Compromized	Central Venous Catheter / Mitral Valve / Prior endocarditis	not specified	not specified	Cured	Ballesteros Sanz et al. 2009
Leuconostoc	*Leuconostoc spp.*	Not specified	Sepsis	Bacteraemia / Septicaemia	Female	1	Spain	Gastroenteritis, Deshydration	Compromized	Immunodeficiency	Metronidazol	Penicilin	Cured	Gonzalez et al. 2009
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Pulmonary Abscess	Organ failure	Male	75	Spain	Smoker for 40y, chronic renal insuffisance, chonic pulmonar obstruction	Immunocompetent	Metabolism disorder / Organ failure	Levofloxacin	Cefditoren	Cured	Camarasa et al. 2009
Leuconostoc	*Leuconostoc spp.*	Not specified	Sepsis	Bacteraemia / Septicaemia	Male	0	United States	Neonate, mother with history of smoking, 24w	Compromized	Immunodeficiency	Vancomycin and Gentamicin	Ampicillin added	Cured	Yossuck et al. 2009
Leuconostoc	*Leuc. pseudomesenteroides*	Not specified	Bacteraemia	Bacteraemia / Septicaemia	Female	64	United States	Liver transplantation. Immunosuppression	Compromized	Immunodeficiency	Clindamycin		Death	Tholpady et al. 2010
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	52	Japan	Leukemia.	Compromized	Immunodeficiency	Cefepim and Meropenem	Gentamicin	Cured	Ishiyama et al. 2010
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	73	Japan	Chemotherapy, Antibiotics	Compromized	Immunodeficiency	Fluconazole	Panipenem	Death	Ishiyama et al. 2010
Leuconostoc	*Leuconostoc spp.*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	65	Japan	Alcoholic cirrhosis	Compromized	Immunodeficiency	IPM/CS		Death	Ishiyama et al. 2010
Leuconostoc	*Leuc. citreum*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. citreum*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. citreum*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. pseudomesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. citreum*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. citreum*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. citreum*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. mesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. pseudomesenteroides*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Taiwan	Not stated.	Not stated.	Not stated.	not specified	not specified	Not specified	Lee et al. 2010
Leuconostoc	*Leuc. lactis*	Not specified	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	South Korea	gastrointestinal amyloidosis in long-standing rheumatoid arthritis and tuberculosis arthritis	Compromized	Metabolism disorder / Organ failure	not specified	not specified	Death	Shin et al. 2011
Leuconostoc	*Leuconostoc spp.*	Not specified	Bacteraemia	Bacteraemia / Septicaemia	Female	24	United States	HIV Infected? Catheter in place	Compromized	Immunodeficiency	intravenous vancomycin		Cured	Wong et al., 2012
Leuconostoc	*Leuconostoc mesenteroides subsp. Mesenteroides*	Not specified	Meningitis	Meningitis	Male	47	Argentina	HIV/AIDS infection with poor adherence to Highly- Active Antirretroviral Therapy (HAART) . Tuberculosis	Compromized	Immunodeficiency	Ampicilline		Death	Barletta et al., 2017
Leuconostoc	*Leuc. Lactis*	Vitek	Bacteraemia	Bacteraemia / Septicaemia	Male	62	India	history of Type 2 diabetes mellitus and hypertension since 4 years	Compromized	Immunodeficiency	vancomycin		Death	Swain et al., 2015
Leuconostoc	*Leuc. pseudomesenteroides*	Maldi-Tof	Pulmonary Inferion	Organ failure	Female	55	China	Lymphoma	Compromized	Metabolism disorder / Organ failure	Cefoxitin, imipenem/cilastin sodium, vancomycin, and voriconazole		Death	Dai et al., 2020

GENRE	Organism	Identification	Clinical Diagnosis	SEPSIS	Sexe	Age (NUM)	Pays	Details (Risk Factor & Predisposing causes, Source of isolation)	Immunostatus	RISK FACTOR	Antibiotherapy : 1st Line	Antibiotherapy : 2nd Line	Outcome	Reference
Leuconostoc	*Leuc. lactis*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Female	83	United States	Pneumonia and Abdominal Infection	Compromized	Metabolism disorder / Organ failure	Vancomycin		Not specified	Yang et al., 2015
Leuconostoc	*Leuconostoc spp.*	Not specified	endophthalmitis	Organ failure	Male	89	Canada		Competent				Not specified	Foster et al., 2021
Weissella	*W. confusa*	Microbiological phenotype	Stool Collection	Colonization	Not specified	Not specified	United States	Colonization of stools during Vancomycin treatment			**Vancomycin**	Penicillin, Ampicillin	Cured	Green et al., 1990
Weissella	*W. confusa*	Microbiological phenotype	Stool Collection	Colonization	Not specified	Not specified	United States	Colonization of stools during Vancomycin treatment			**Vancomycin**	Penicillin, Ampicillin	Cured	Green et al., 1990
Weissella	*W. confusa*	Microbiological phenotype	Stool Collection	Colonization	Not specified	Not specified	United States	Colonization of stools during Vancomycin treatment			**Vancomycin**	Penicillin, Ampicillin	Cured	Green et al., 1990
Weissella	*W. confusa*	Microbiological phenotype	Stool Collection	Colonization	Not specified	Not specified	United States	Colonization of stools during Vancomycin treatment			**Vancomycin**	Penicillin, Ampicillin	Cured	Green et al., 1990
Weissella	*W. confusa*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	United States	Colonization of stools during Vancomycin treatment			**Vancomycin**	Penicillin, Ampicillin	Cured	Green et al., 1990
Weissella	*W. confusa*	Microbiological phenotype	Stool Collection	Colonization	Not specified	Not specified	United States	Colonization of stools during Vancomycin treatment	Compromized	Liver Transplant Recipient (Immunosuppressed)	**Vancomycin**	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Weissella	*W. confusa*	Microbiological phenotype	Stool Collection	Colonization	Not specified	Not specified	United States	Colonization of stools during Vancomycin treatment	Compromized	Liver Transplant Recipient (Immunosuppressed)	**Vancomycin**	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Weissella	*W. confusa*	Microbiological phenotype	Stool Collection	Colonization	Not specified	Not specified	United States	Colonization of stools during Vancomycin treatment	Compromized	Liver Transplant Recipient (Immunosuppressed)	**Vancomycin**	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Weissella	*W. confusa*	Microbiological phenotype	Stool Collection	Colonization	Not specified	Not specified	United States	Colonization of stools during Vancomycin treatment	Compromized	Liver Transplant Recipient (Immunosuppressed)	**Vancomycin**	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Weissella	*W. confusa*	Microbiological phenotype	Stool Collection	Colonization	Not specified	Not specified	United States	Colonization of stools during Vancomycin treatment	Compromized	Liver Transplant Recipient (Immunosuppressed)	**Vancomycin**	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Weissella	*W. confusa*	Microbiological phenotype	Stool Collection	Colonization	Not specified	Not specified	United States	Colonization of stools during Vancomycin treatment	Compromized	Liver Transplant Recipient (Immunosuppressed)	**Vancomycin**	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Weissella	*W. confusa*	Microbiological phenotype	Stool Collection	Colonization	Not specified	Not specified	United States	Colonization of stools during Vancomycin treatment	Compromized	Liver Transplant Recipient (Immunosuppressed)	**Vancomycin**	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Weissella	*W. confusa*	Microbiological phenotype	Stool Collection	Colonization	Not specified	Not specified	United States	Colonization of stools during Vancomycin treatment	Compromized	Liver Transplant Recipient (Immunosuppressed)	**Vancomycin**	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Weissella	*W. confusa*	Microbiological phenotype	Stool Collection	Colonization	Not specified	Not specified	United States	Colonization of stools during Vancomycin treatment	Compromized	Liver Transplant Recipient (Immunosuppressed)	**Vancomycin**	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Weissella	*W. confusa*	Microbiological phenotype	Stool Collection	Colonization	Not specified	Not specified	United States	Colonization of stools during Vancomycin treatment	Compromized	Liver Transplant Recipient (Immunosuppressed)	**Vancomycin**	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Weissella	*W. confusa*	Microbiological phenotype	Stool Collection	Colonization	Not specified	Not specified	United States	Colonization of stools during Vancomycin treatment	Compromized	Liver Transplant Recipient (Immunosuppressed)	**Vancomycin**	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Weissella	*W. confusa*	Microbiological phenotype	Stool Collection	Colonization	Not specified	Not specified	United States	Colonization of stools during Vancomycin treatment	Compromized	Liver Transplant Recipient (Immunosuppressed)	**Vancomycin**	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Weissella	*W. confusa*	Microbiological phenotype	Stool Collection	Colonization	Not specified	Not specified	United States	Colonization of stools during Vancomycin treatment	Compromized	Liver Transplant Recipient (Immunosuppressed)	**Vancomycin**	Daptomycin (Resistance to Teicoplanin)	Cured	Green et al., 1991
Weissella	*W. confusa*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	71	United States	Cecal carcinoma					Cured	Riebel and Washington, 1990
Weissella	*W. confusa*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Female	12	United States	Vegetative state, gastrostomy					Cured	Riebel and Washington, 1990
Weissella	*W. confusa*	Microbiological phenotype	Thumb abscess	Abscess	Male	49	Argentina	Palm tree splinter to the right thumb					Cured	Bantar et al., 1991
Weissella	*W. confusa*	Microbiological phenotype	Bacteraemia	Bacteraemia / Septicaemia	Male	46	United States	One year previous, underwent abdominal aortic dissection and small bowel resection. Short bowel syndrome. Antibiotic treatment, 3 months prior. Co-culture with Klebsiella pneumoniae.					Cured	Olano et al., 2001
Weissella	*W. confusa*	16S RNA sequence clustering	Endocarditis	Endocarditis	Male	49	United States	Not stated.					Death	Flaherty et al. 2003
Weissella	*Weissella spp.*	RAPD PCR	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Sweden	Not stated.					Not specified	Sullivan et al. 2006
Weissella	*W. confusa*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Thailand	Not stated.						Kulwichit et al., 2007
Weissella	*W. confusa*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Not specified	Not specified	Thailand	Not stated.						Kulwichit et al., 2007
Weissella	*W. confusa*	16S RNA sequence clustering	Not Specified	Not Specified	Not specified	Not specified	Thailand	Not stated.						Kulwichit et al., 2007
Weissella	*W. confusa*	16S RNA sequence clustering	Not Specified	Not Specified	Not specified	Not specified	Thailand	Not stated.						Kulwichit et al., 2007

GENRE	Organism	Identification	Clinical Diagnosis	SEPSIS	Sexe	Age (NUM)	Pays	Details (Risk Factor & Predisposing causes, Source of isolation)	Immunostatus	RISK FACTOR	Antibiotherapy : 1st Line	Antibiotherapy : 2nd Line	Outcome	Reference
Weissella	*W. confusa*	16S RNA sequence clustering	Endocarditis	Endocarditis	Male	65	South Korea	Angina perctoris, Aortic insufficiency	Competent	Central Venous Catheter / Mitral Valve / Prior endocarditis	Penicillin and Gentamicin	Gentamicin	Cured	Shin et al. 2007
Weissella	*W. confusa*	BACT Alert	Bacteraemia	Bacteraemia / Septicaemia	Male	4	Czech republic	Peritoneal neuroblastoma					Cured	Svec et al. 2007
Weissella	*W. confusa*				Male	54	United States	nonalcoholic steatohepatitis and hepatocellular carcinoma presented 2 months after an orthotopic liver transplant	Compromized	Organ Transplant				Harlan et al. 2011
Weissella	*W. confusa*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Female	58	Taiwan	non hodgkin's lymphoma	Compromized	Immunodeficiency	**Vancomycin,** ceftazidime		Death	Lee et al. 2011
Weissella	*W. confusa*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Male	68	Taiwan	chronic obstructive pulmonary disease	Competent	Metabolism disorder / Organ failure	Ampicilline		Death	Lee et al. 2011
Weissella	*W. confusa*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Female	62	Taiwan	B cell lymphoma	Compromized	Immunodeficiency	**Vancomycin,** ceftazidime		Death	Lee et al. 2011
Weissella	*W. confusa*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Female	92	Taiwan	chronic renal failure	Competent	Metabolism disorder / Organ failure	Ampicilline		Death	Lee et al. 2011
Weissella	*W. confusa*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Female	27	Taiwan	thyroid goitre, akylosing spondylitis	Compromized	Immunodeficiency	Amoxicillin		Cured	Lee et al. 2011
Weissella	*W. confusa*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Female	62	Taiwan	ischaemic bowel	Competent	Metabolism disorder / Organ failure	No		Death	Lee et al. 2011
Weissella	*W. confusa*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Male	73	Taiwan	cancerous peritonitis	Compromized	Immunodeficiency	cefepime		Death	Lee et al. 2011
Weissella	*W. confusa*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Male	52	Taiwan	oesophogal cancer	Compromized	Immunodeficiency	Amoxicillin		Cured	Lee et al. 2011
Weissella	*W. confusa*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Female	8	Taiwan	ileus	Competent	Metabolism disorder / Organ failure	**Vancomycin,** ceftazidime		Cured	Lee et al. 2011
Weissella	*W. confusa*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Male	64	Taiwan	subarachnoid hemorrhage	Competent	Wound and/or Invasive procedure	Amoxicillin		Cured	Lee et al. 2011
Weissella	*W. confusa*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Male	34	United States	Allogeneic hematopoietic stem cell transplant	Compromized	Immunodeficiency	**Vancomycin,** aztreonam	Daptomycin	Cured	Salimnia et al. 2010
Weissella	*W. confusa*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Male	58	United States	Third Degree Burns	Competent	Wound and/or Invasive procedure	**Vancomycin,** imipenem	Daptomycin	Cured	Salimnia et al. 2010
Weissella	*W. confusa*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Male	48	India	operated on for adenocarcinoma of the gastro-oesophageal junction and maintained on total parenteral nutrition	Compromized	Total parenteral nutrition	cefoperazone–sulbactam and metronidazole		Cured	Kumar et al., 2011
Weissella	*W. confusa*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Female	60	South Korea	Underlying Intramural Hematomas of the Aorta	Competent		ceftriaxone	teicoplanin plus piperacillin-tazobactam	Cured	Wonmok Lee et al., 2013
Weissella	*W. confusa*	16S RNA sequence clustering	Local Infection	Abscess	Female	94	Canada	Prosthetic Joint Infection	Competent	Total knee arthroplasty	Levofloxacin for her E coli bacteremia		Not Cured	Medford etal., 2014
Weissella	*W. confusa*	16S RNA sequence clustering	Bacteraemia	Bacteraemia / Septicaemia	Female	63	United States	mul- tiple surgeries, including end ileostomy. peripherally inserted central catheter (PICC) in place for 3 months for total parenteral nutrition (TPN)	Compromized	Crohn's Disease	**Vancomycin**	daptomycin and piperacillin-tazobactam	Cured	Vasquez et al., 2015
Weissella	*W. confusa*	Maldi-Tof	Bacteraemia	Bacteraemia / Septicaemia	Male	14	France	Blastoma Chemiotherapy	Compromized	Blastoma Chemiotherapy	piperacilline + tazobactam + **vancomycine**	clindamycine + amikacyne	Cured	Aberkane et al., 2017
Weissella	*W. confusa*	Maldi-Tof	Bacteraemia	Meningitis	Male	78	Lebanon	Alzheimer's disease, diabetes mellitus type 2, coronary artery disease status post percutane- ous transluminal coronary angioplasty and insertion of two stents on clopidogrel	Compromized	Immunodeficiency	**Vancomycin**, cocktail	Ampicillin	Cured	Cheaito et al., 2020
Weissella	*W. confusa*	Maldi-Tof	Endocarditis	Endocarditis	Male	63	United Kingdom	type 2 diabetes mellitus	Compromized	Immunodeficiency	Amoxicillin		Cured	Hurt et al., 2021