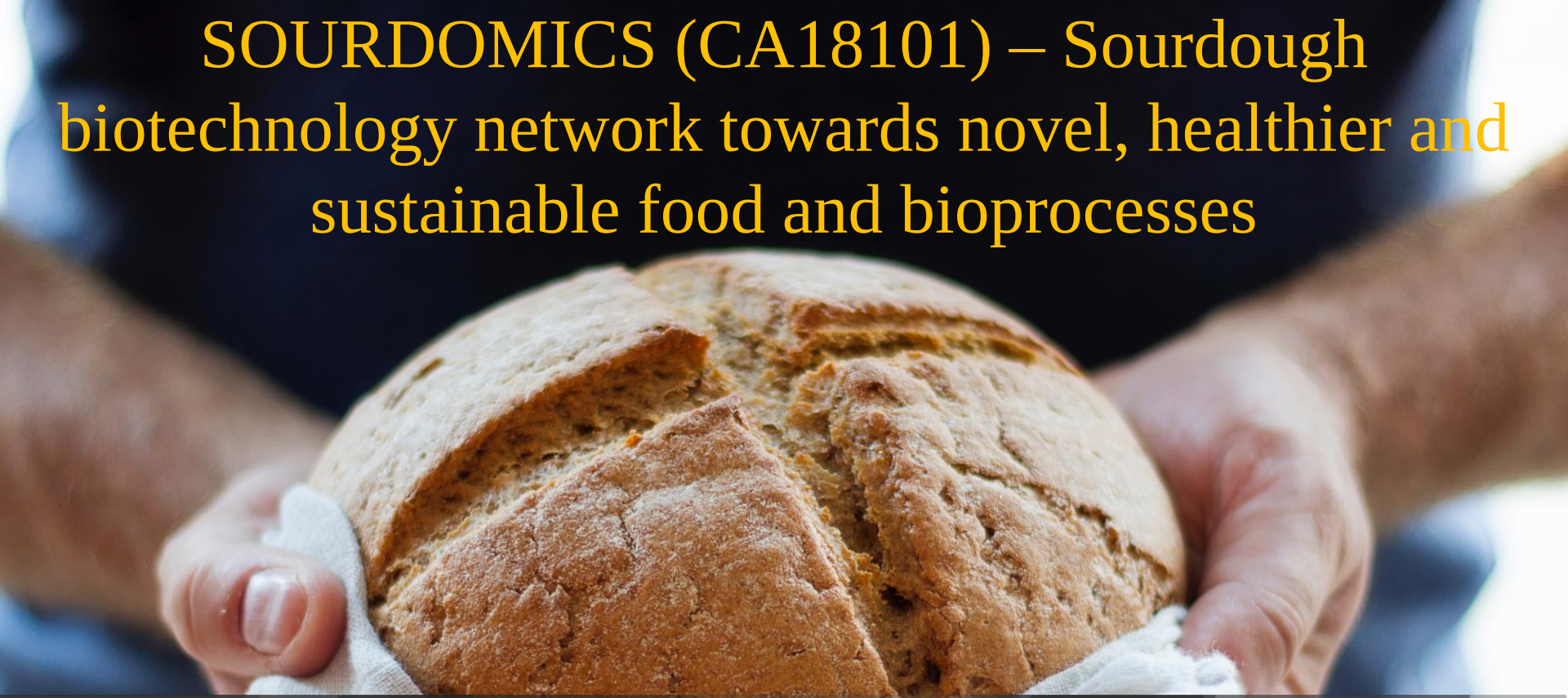
SOURDOMICS (CA18101) – Sourdough biotechnology network towards novel, healthier and sustainable food and bioprocesses



SOURDOMICS

BrIAS Workshop W05
Food Fermentation and Human Health
03th March 2023, Brussels, Belgium

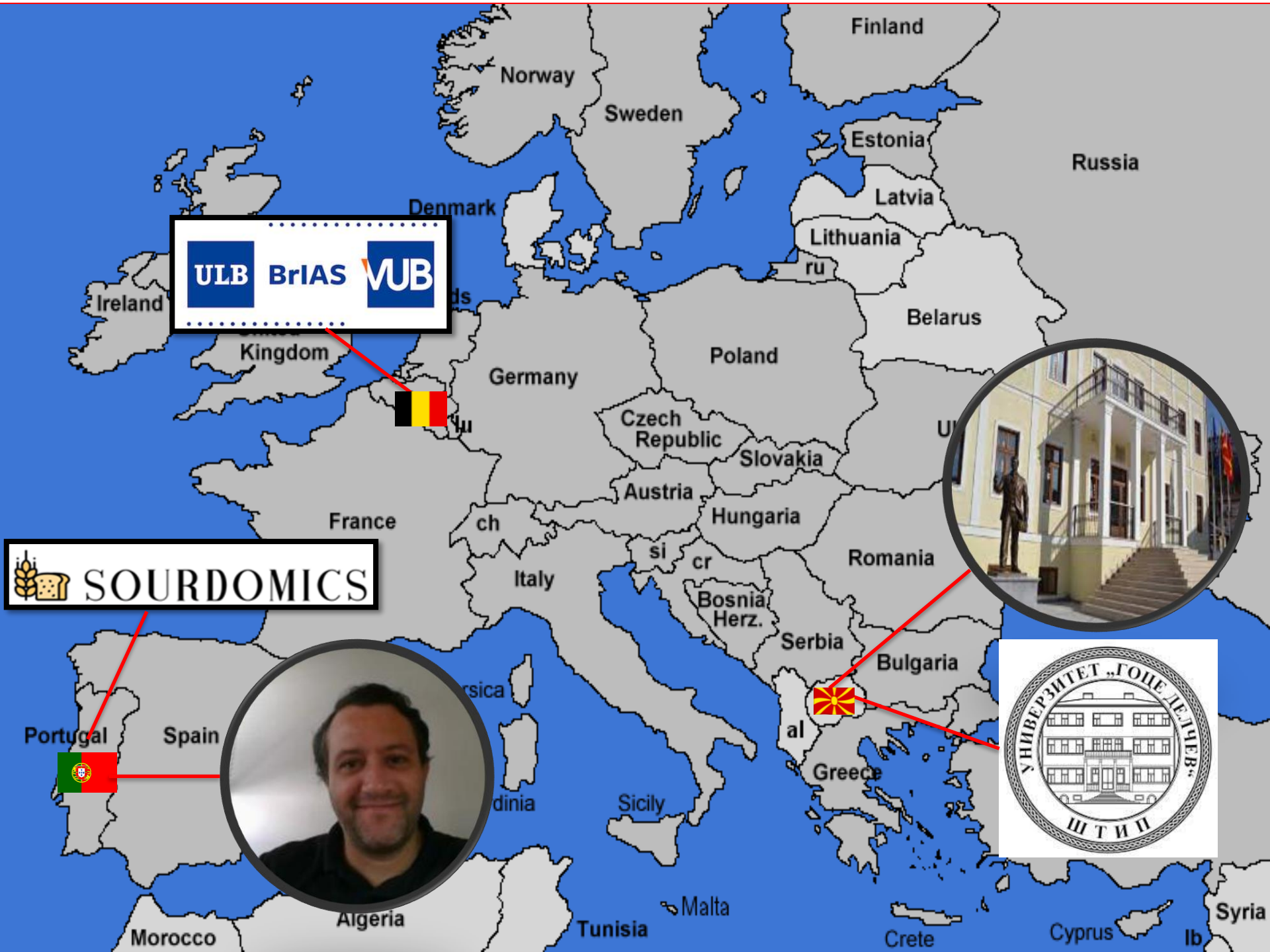
cost
EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

ULB BrIAS VUB

SOURDOMICS

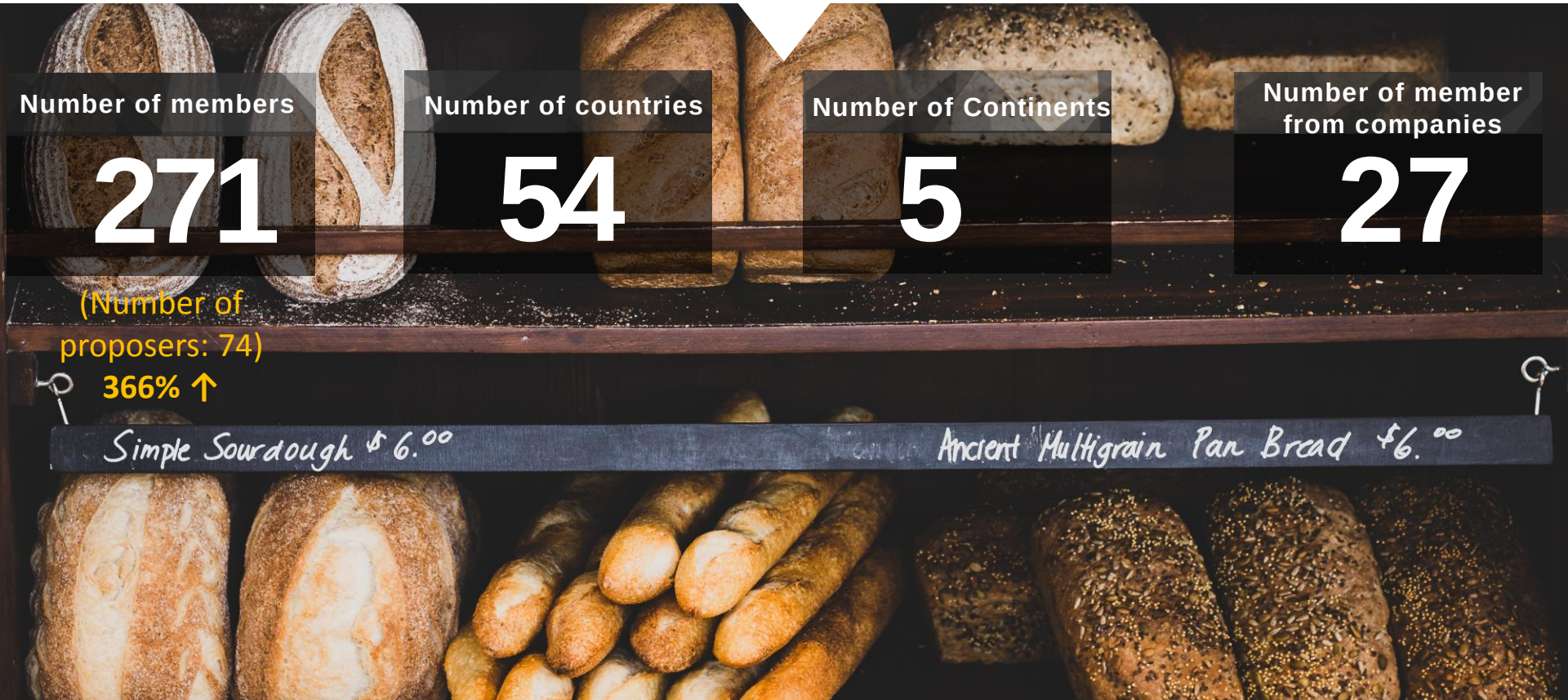
CONTENT OF THE PRESENTATION

- THE HEALTH BENEFITS OF SOURDOUGH BREAD
- THESOURDOMICS COST ACTION OBJECTIVES AND IMPACTS


Finland
Norway
Sweden
Estonia
Russia
Latvia
Denmark
Lithuania
ru
ULB
BrIAS
VUB
Ireland
Belarus
Kingdom
Poland
Germany
Czech Republic
Slovakia
Austria
Hungaria
France
ch
si
cr
Romania
Italy
Bosnia Herz.
Serbia
Bulgaria
SOURDOMICS
Portugal
Spain
al
Greece
Sicily
Malta
Tunisia
Algeria
Morocco
Crete
Cyprus
Syria
УНИВЕРЗИТЕТ „ГОЦЕ ДЕЛЧЕВ“
Ш Т И П

SOURDOMICS

THE “COMMUNITY OF SOURDOUGH”



Number of members

271

(Number of proposers: 74)

366% ↑

Number of countries

54

Number of Continents

5

Number of member from companies

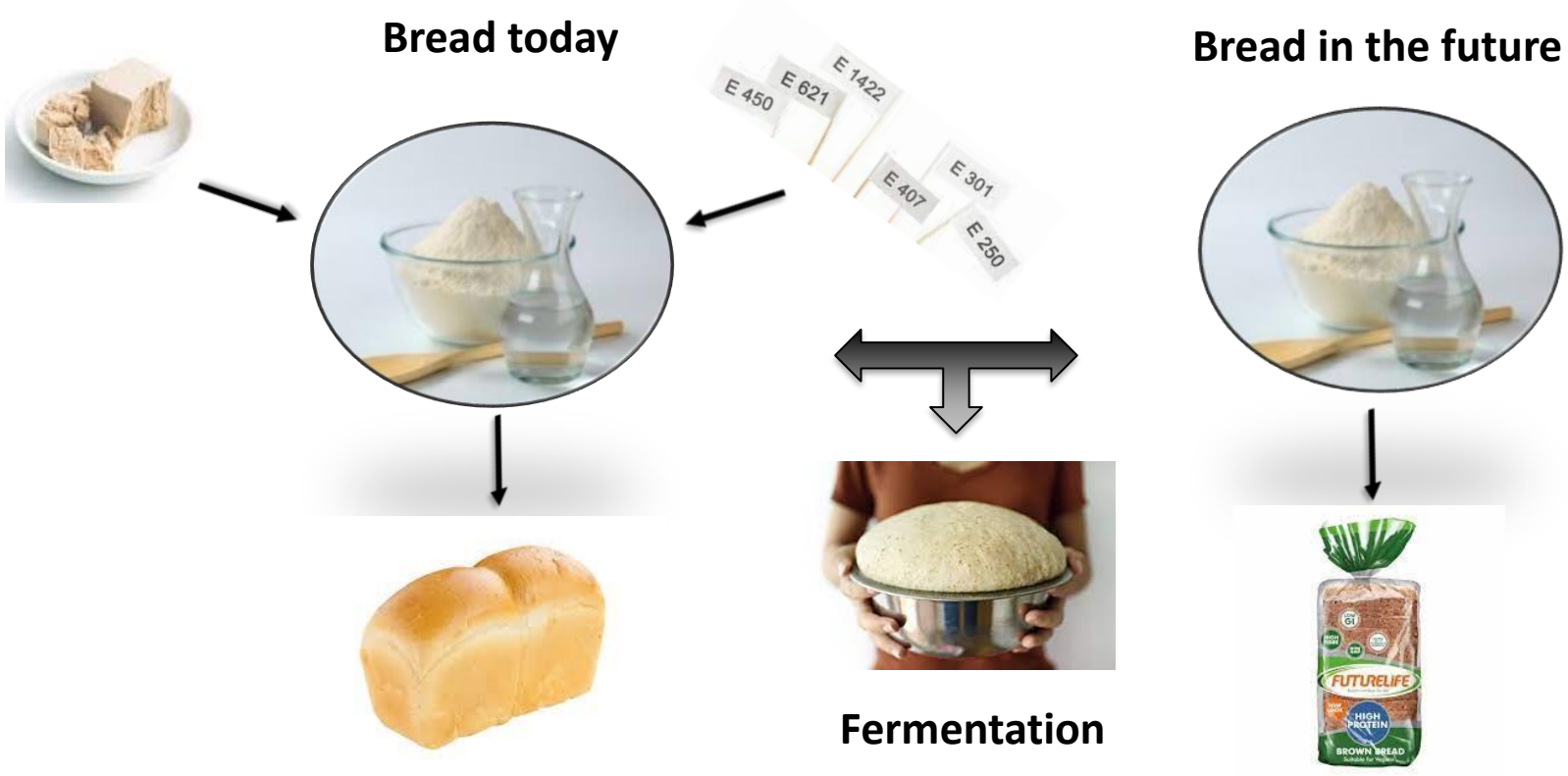
27

SOURDOMICS

Sourdough biotechnology network towards novel, healthier and sustainable food and bioprocesses

SOURDOMICS

THE SCIENCE BEHIND SOURDOUGHT



SOURDOMICS

Homofermentative LAB	Obligate heterofermentative LAB		Facultative heterofermentative LAB	Yeasts
Enterococcus casseliflavus	*Levilactobacillus acidifarinae, Levilactobacillus brevis, Limosilactobacillus fermentum*	*Lentilactobacillus hilgardii*	*Companilactobacillus alimentarius*	*Saccharomyces cerevisiae*
Enterococcus durans	*Limosilactobacillus reuteri, Limosilactobacillus pontis, Furfurilactobacillus rossiae*	*Fructilactobacillus fructivorans*	*Companilactobacillus paralimentarius*	*Saccharomyces bayanus*
Enterococcus faecalis	*Limosilactobacillus panis, Companilactobacillus crustorum*	*Lentilactobacillus kefiri, Apilactobacillus kunkeei, Fructilactobacillus lindneri*	*Lactiplantibacillus plantarum*	*Kazachstania exigua*
Enterococcus faecium	*Latilactobacillus curvatus*	*Limosilactobacillus mucosae, Limosilactobacillus fermentum, Secundilactobacillus collinoides*	*Lacticaseibacillus casei, Lacticaseibacillus paracasei Lacticaseibacillus rhamnosus*	*Kazachstania humilis*
Lactobacillus amylovorus	*Limosilactobacillus frumenti, Fructilactobacillus fructivorans*	*Limosilactobacillus vaginalis, Levilactobacillus zymae, Leuconostoc citreum*	*Levilactobacillus spicheri*	*Kazachstania servazzi*
Lactobacillus amylolyticus	*Levilactobacillus hammesii*	*Leuconostoc gelidum*	*Lactiplantibacillus xiangfangensis*	*Kazachstania exigua*
Lactobacillus delbrueckii	*Levilactobacillus koreensis, Levilactobacillus namurensis*	*Leuconostoc mesenteroides*	*Limosilactobacillus coleohominis*	*Pichia kudriavzevii*
Lactobacillus acidophilus	*Companilactobacillus nodensis*	*Weissella cibaria*	*Companilactobacillus kimchii*	*Torulaspora delbrueckii*
Companilactobacillus farciminis	*Limosilactobacillus oris, Lentilactobacillus parabuchneri*	*Weissella confusa*	*Lactiplantibacillus pentosus*	*Wickerhamomyces anomalus*
Lactobacillus johnsonii	*Fructilactobacillus sanfranciscensis*	*Weissella hellenica*	*Schleiferilactobacillus perolens*	*Pichia kudriavzevii*
Companilactobacillus crustorum	*Limosilactobacillus secaliphilus*	*Weissella kandleri*	*Latilactobacillus sakei*	*Candida tropicalis*
Companilactobacillus heilongjiangensis	*Furfurilactobacillus siliginis*		*Pediococcus acidilactici*	*Candida glabrata*
Companilactobacillus mindensis	*Lentilactobacillus buchneri, Fructilactobacillus fructivorans*		*Lapidilactobacillus dextrinicus*	*Candida krusei*
Companilactobacillus nantensis			*Pediococcus pentosaceus*	*Candida pelicullosa*
Companilactobacillus nodensis				*Yarrowia keelungensis*
Lactobacillus crispatus				*Torulaspora delbrueckii*
Lactobacillus gallinarum				*Rhodotorula mucilaginosa*
Lactobacillus gasseri				
Lactobacillus helveticus				
Liquorilactobacillus nagelii				
Ligilactobacillus salivarius, Streptococcus constellatus				
Streptococcus equinus				
Streptococcus suis				

cost EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

SOURDOMICS
Sourdough biotechnology network towards novel, healthier and sustainable food and bioprocesses

ULB BrIAS VUB

SOURDOMICS

SOURDOUGH BREAD ADVANTAGES

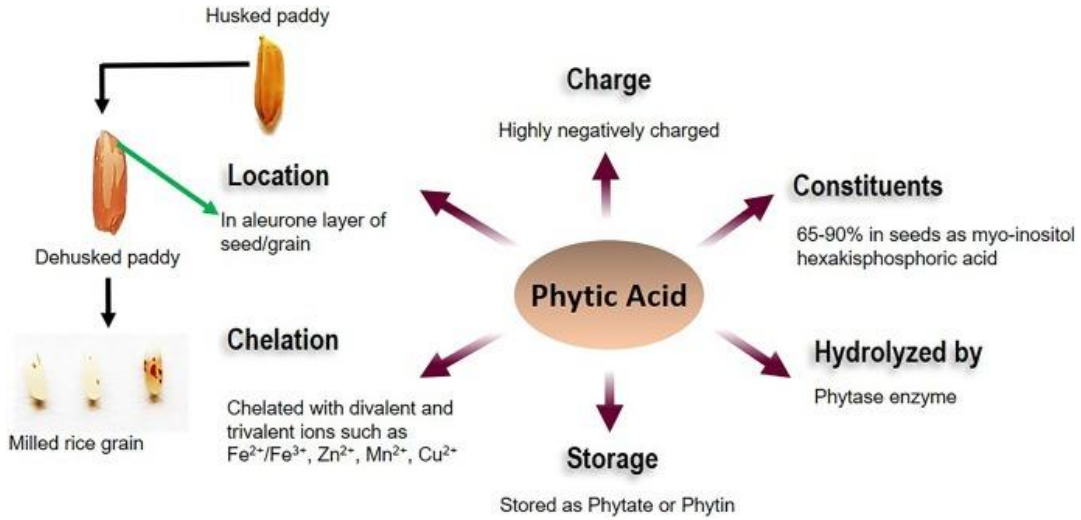
Levain

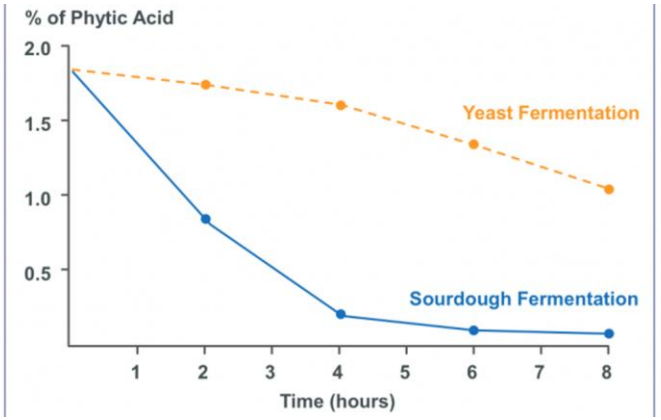
Sourdough bread

- Bioavailability
- Glycemic index
- Antioxidant activity
- Digestibility
- Contaminants

SOURDOMICS

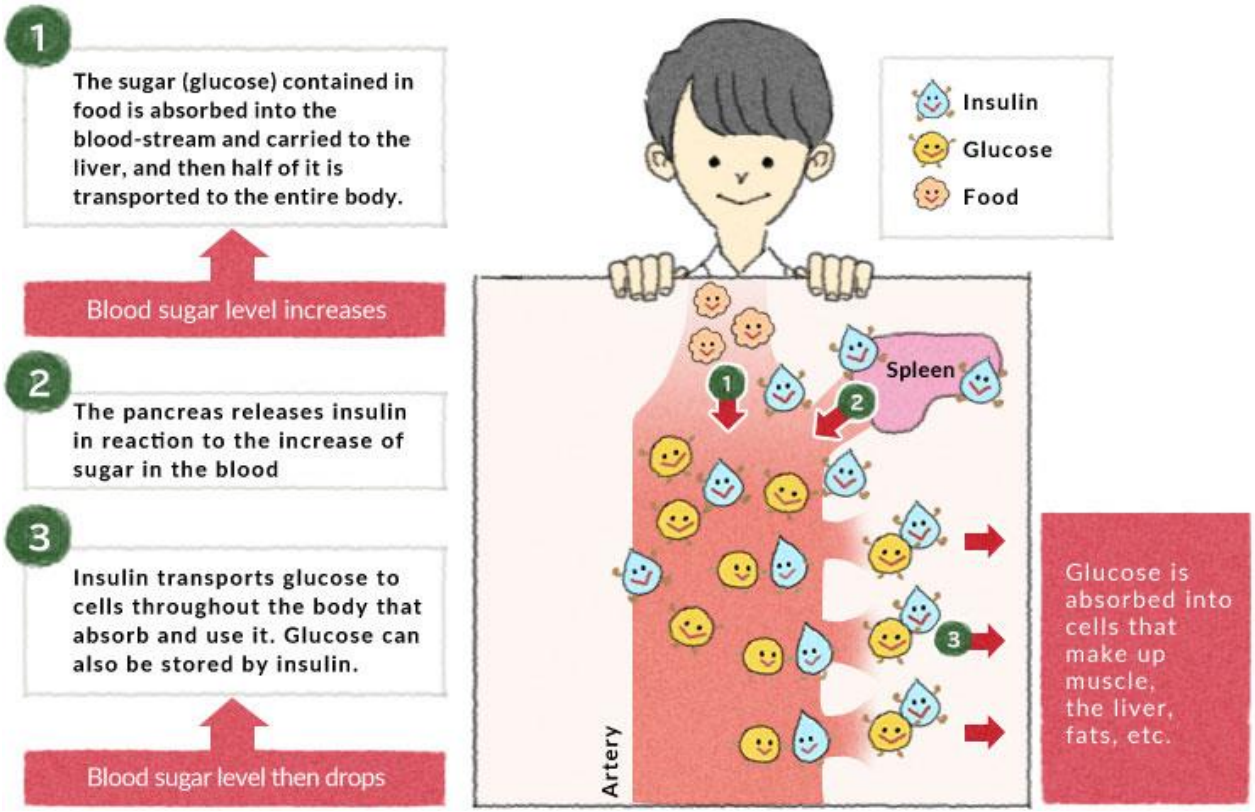
GREATER BIOAVAILABILITY OF NUTRIENTS





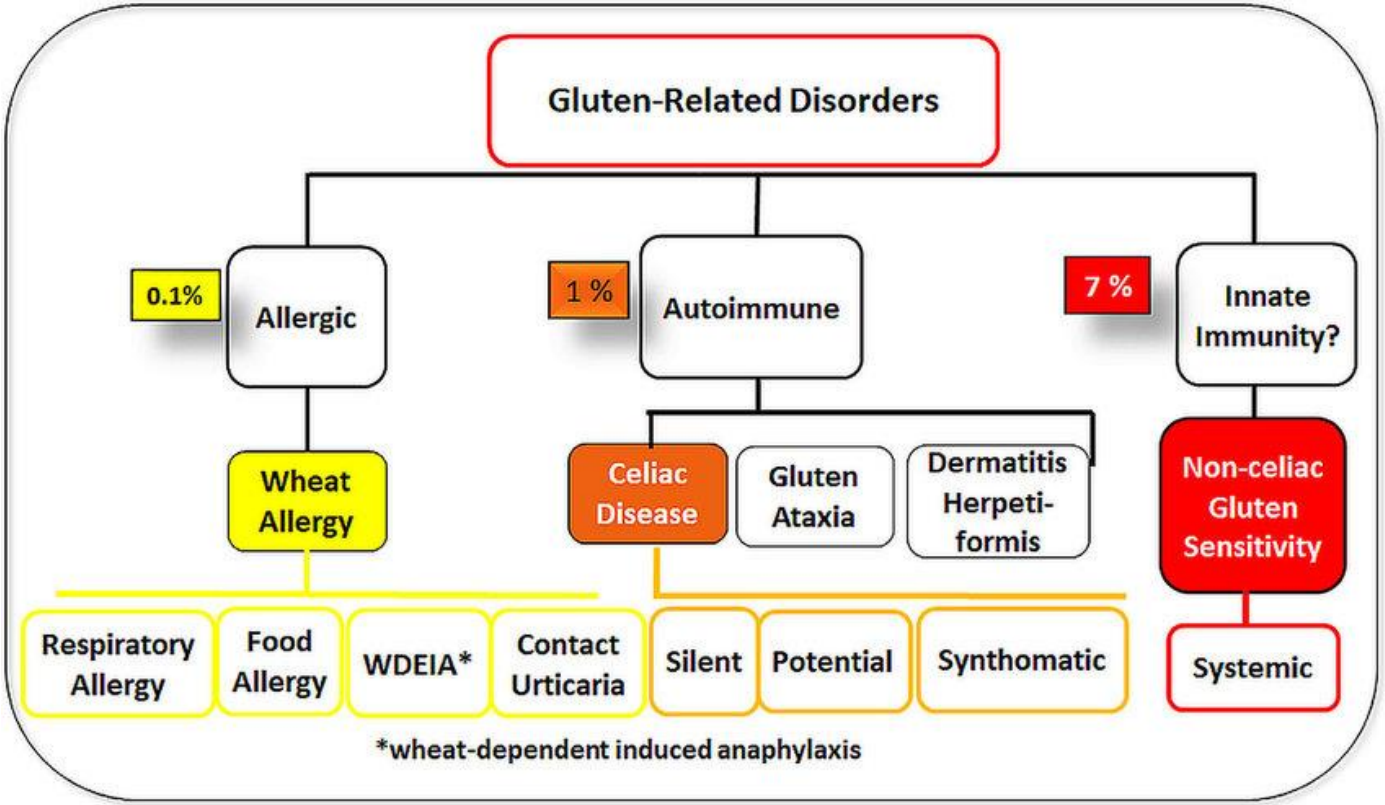
SOURDOMICS

LOWER GLYCEMIC INDEX



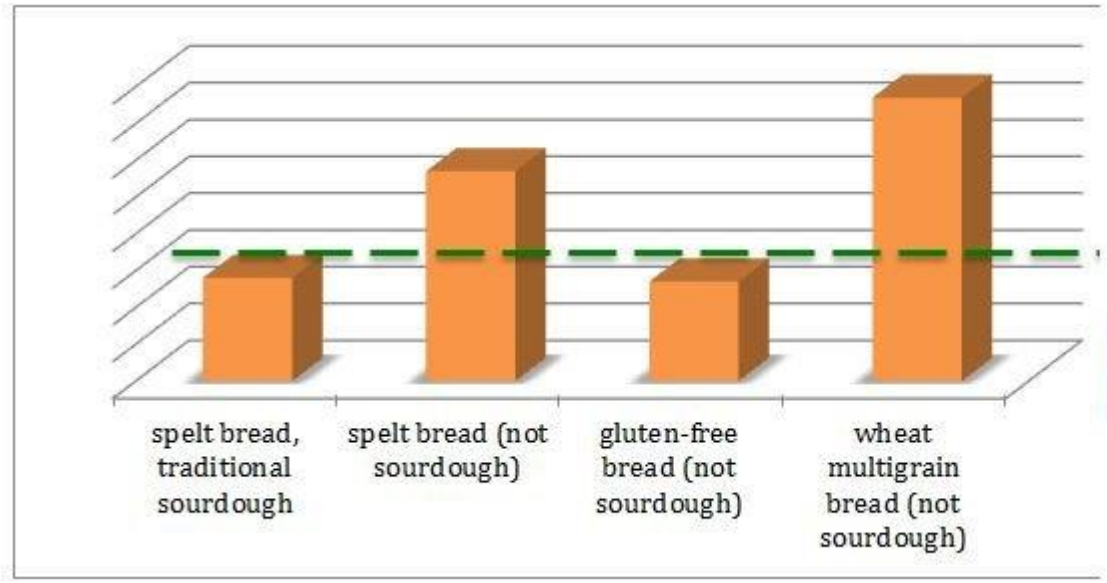
SOURDOMICS

LOWER GLUTEN CONTENT



SOURDOMICS

LOW FODMAPs CONTENT



Below the green line- low FODMAP

FODMAPs – Fermentable oligo-, di- and monosaccharides and polyols

SOURDOMICS

EXPOPOLYSACCHARIDES

HoPS ← EPS Production → HePS

Contain only one type of monosaccharide	Contain two or more types of monosaccharides
Glucose or Fructose	Glucose, Galactose and Rhamnose
α or β link present	α or β link present
Typically linear or branched	Typically branched
Molecular mass: > 10^6 Da	Molecular mass: 10^4 - 10^6 Da
Produced extracellularly	Produced from intracellular intermediates

EPS from LAB: Industrial applications

- Viscosifiers, stabilizers, emulsifiers and gelling agents.
- Replace or reduce the use of external hydrocolloids.
- *In situ* production in fermented foods.

EPS Health benefits

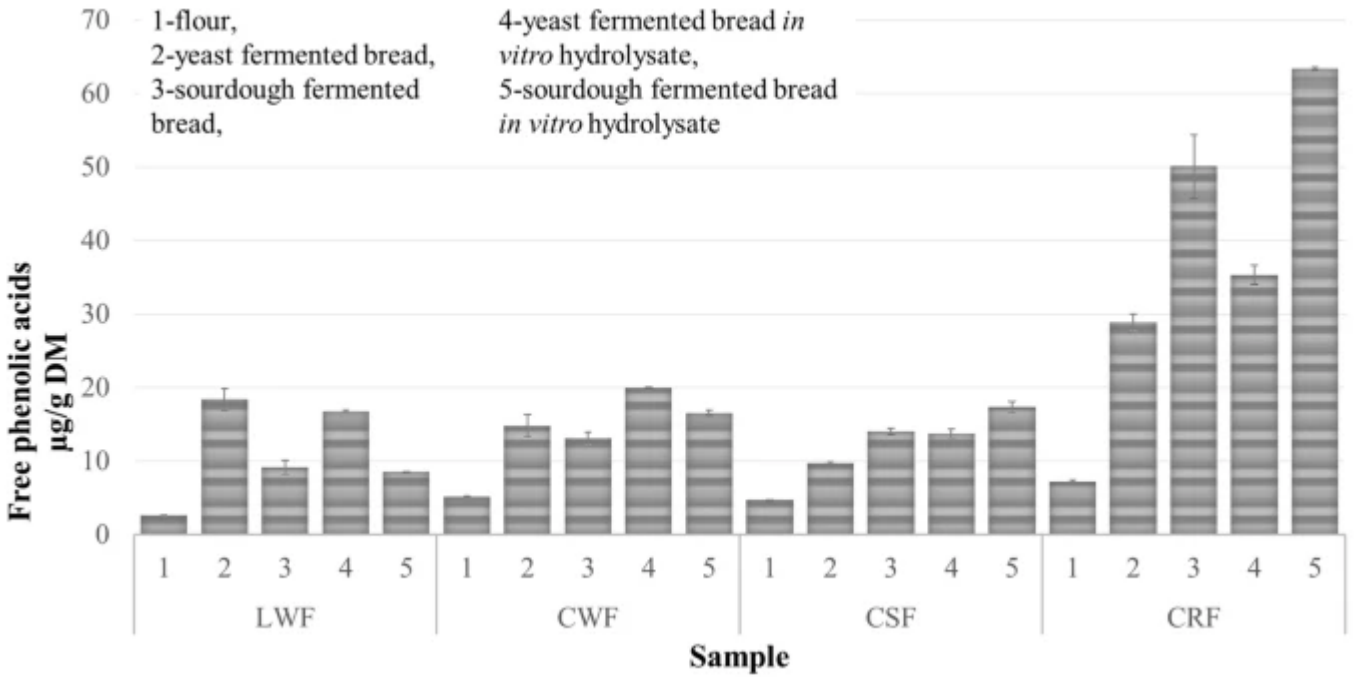
- Reducing cholesterol and triglyceride levels
- Antiinflamatory effect
- Benefits for probiotic microorganisms
- Stimulate SCFAs production
- Antidepression effects
- Beneficial effects on autism, anxiety and stress
- Anticancerogenic affect

EPS applications in bakery products

- Increase of water absorption of the dough.
- Better dough rheology and machinability.
- Maintenance of bread structure.
- Increase of loaf volume.
- Increased crumb softness and delayed bread staling, leading to increased shelf-life.
- Future perspectives: application of LAB-EPS in gluten-free bread.

SOURDOMICS

HIGH ANTIOXIDANT AND ANTIMICROBIAL ACTIVITY



Relevance and timeliness of SOURDOMICS

- ✓ Sourdough bread and other sourdough-based baking goods (*e.g.* biscuits, crackers, pastry, pizza and pasta) are enjoying an increasing popularity as convenient, nutritious, stable, natural, low-processed and healthy food

- ✓ Increase of its consumption will depend on innovation and improvement of cereal-based products and breadmaking technologies to meet the required food quality and modern consumers' demands and, thus, may influence consumers' preferences and market orientations

- ✓ Baking companies are striving to develop innovative products to compete in a global market, and sourdough technologies may play an important role in such an ambitions

- ✓ Research on the topic of sourdough biotechnology is decisively a hotspot in biotechnology not only in Europe but Worldwide

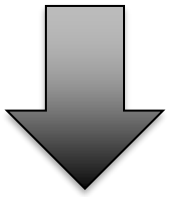
- ✓ SOURDOMICS emerged from this scenario. Its intent is to be an **aggregator and transnational coordinator of dispersed knowledge and a driving force for the technology transfer**

SOURDOMICS

CHALLENGE / MAIN AIM

To exploit sourdough biotechnology along entire value chain in a circular economy standpoint:

- from sustainable production of raw materials (cereals),
- through exploitation of fermentation processes,
- to valorisation of by-products and food wastes therefrom



How to achieve such a challenge?

SOURDOMICS

HOW TO ACHIEVE SUCH A CHALLENGE?

- Bringing together a multidisciplinary group of scientists focused on the technology of cereals, sourdough biotechnology and breadmaking.
- Following a bottom-up approach: farmers, companies and other stakeholders have a fundamental presence in SOURDOMICS' activities.
- Bringing together knowledge from decades of research in sourdough biotechnology (since late 1970's), while **going much beyond** in a way

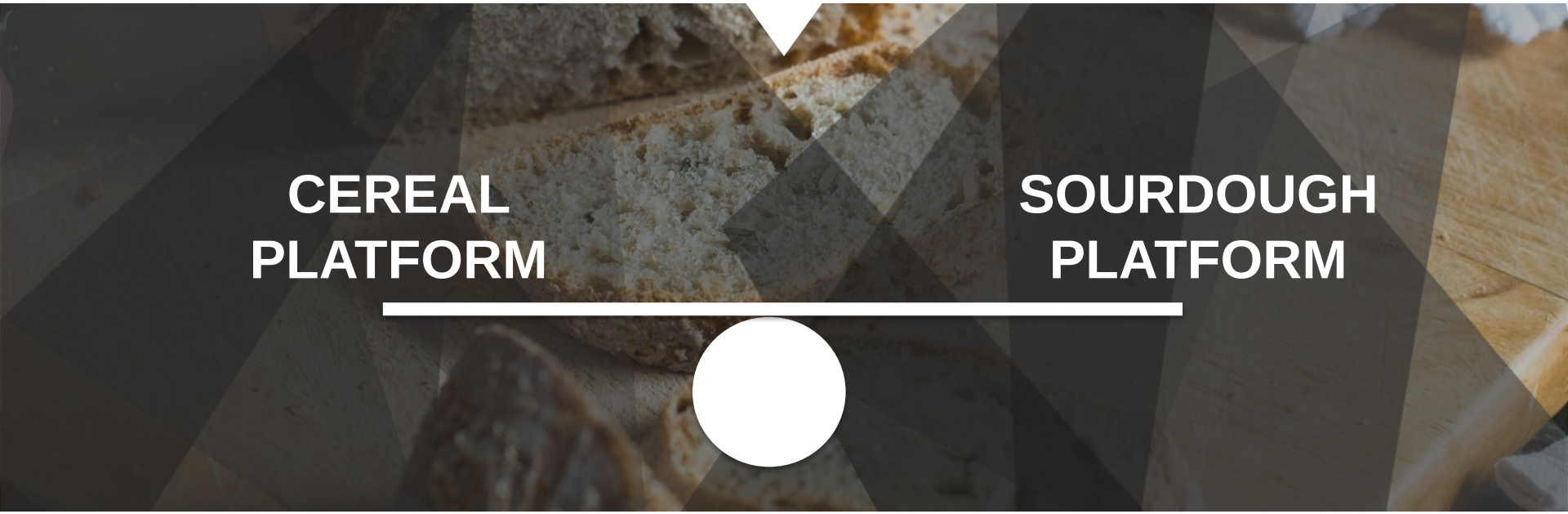
↓

  - to better respond to the new Global Social Challenges (SC), and
  - to put the (bio)advances at service of our society by providing and implementing effectively a varied and large number of novel industrial, agricultural and commercial applications.

- Commitment in making researchers and enterprises to work together and to share knowledge, laboratorial facilities, research projects and other resources

SOURDOMICS

Two scientific platforms of intervention



DESIGN OF SOURDOMICS

WG1. Recovery, characterization and selection of autochthonous conventional and nonconventional (pseudo)cereal seeds

WG2. Screening and characterization cereal flour and sourdough microbiota

WG3. Design and development sourdough starter cultures for breadmaking and other agri-food products

WG4. Production, extraction and purification functional sourdough metabolites

WG5. Enzymatic processes based on cereals and sourdough technology

WG6. Project design and development innovative prototypes of products and small-scale processing technologies

WG7. Valorization of by-products, residues and food wastes throughout the entire value chain

WG8. Food safety, health promoting, sensorial perception and consumers' behaviour

WG9. Economic feasibility, environmental sustainability, and business case development and team qualification

DCEB. Awareness, impact maximization and research data exploitation

SOURDOMICS

Core Group

Chair | Vice-Chair | WGL1 WGVL1 | WGL9 WGVL9 | DCEBC

João M. Rocha

Portugal

Chair

Elena Bartkiene

Lithuania

Vice-Chair / WGL6

SOURDOMICS

WG1. RECOVERY, CHARACTERIZATION AND SELECTION OF AUTOCHTHONOUS CONVENTIONAL AND NONCONVENTIONAL (PSEUDO)CEREAL SEEDS

Marianna Rakszegi

Hungary

WGL1

Maria Papageorgiou

Greece

WGVL1

Main objectives:

Selection and characterization of autochthonous cereal and pseudocereal seeds from gene banks with better technological, functional, nutritional and healthy performances;

- Sustainable (and non-extensive) agriculture and resilient seeds;
- Optimization of agronomical and post-harvest practices in collaboration with small farmers.

SOURDOMICS

WG2. SCREENING AND CHARACTERIZATION CEREAL FLOUR AND SOURDOUGH MICROBIOTA

Susanne Miescher Schwenninger

Switzerland

WGVL2

ENES DERTLI

Turkey

WGVL2

Main objectives:

- Genotype characterization of microbiota present in cereals and sourdoughs;
- Revailing of the encrypted genetic potential and environmental expression of genetic traits;
- Selection of microorganisms according to health, nutritional and technological attributes and target applications.

SOURDOMICS

WG3. DESIGN AND DEVELOPMENT SOURDOUGH STARTER CULTURES FOR BREADMAKING AND OTHER AGRI-FOOD PRODUCTS

Grazina Juodeikiene

Lithuania

WGL3

Elaine B. Ceresino

Sweden

WGVL3

Main objectives:

- Modelling and optimization of the environmental and growth conditions of single/co-culture fermentations to improve technological, nutritional and health attributes of sourdough.
- Elucidation of the driving forces and mechanisms that keep microbial consortia stable and productive

SOURDOMICS

WG4. PRODUCTION, EXTRACTION AND PURIFICATION FUNCTIONAL SOURDOUGH METABOLITES

Kristian Pastor

Republic of Serbia

WGL4

Dubravka Novotni

Croatia

WGVL4

Main objectives:

- Extraction, separation and purification of functional compounds/fractions using chromatographic and other separation methods.
- Elucidation of the metabolic pathways involved in conversion of different substrates into high-added value functional metabolites;
- Design bioengineered microorganisms to improve and optimize functional metabolite production yields

SOURDOMICS

WG5. ENZYMATIC PROCESSES BASED ON CEREALS AND SOURDOUGH TECHNOLOGY

Twan America

Netherlands

WGL5

Fabienne Verté

Belgium

WGVL5

Main objectives:

- Screening novel enzymes of biotechnological interest in cereals, sourdoughs (extreme acidic doughs, and other extreme factors, e.g. T, aw);
- Extraction and purification of selected enzymes (with interest for baking and other industries) and their physicochemical and biophysical characterization;

SOURDOMICS

WG6. PROJECT DESIGN AND DEVELOPMENT INNOVATIVE PROTOTYPES OF PRODUCTS AND SMALL-SCALE PROCESSING TECHNOLOGIES

Spyridon Paramythiotis

Greece

WGVL6

Elena Bartkiene

Lithuania

Vice-Chair / WGL6

Main objectives:

- Development of new formulations and types of healthier bread and baking goods (ex. biscuits, cookies, pasta)
- Novel product and processing prototypes based on cereals, sourdough microorganisms, enzymes and metabolites;
- Optimization of sourdough fermentation and baking processes to improve reproducibility between batches

SOURDOMICS

WG7. VALORIZATION OF BY-PRODUCTS, RESIDUES AND FOOD WASTES THROUGHOUT THE ENTIRE VALUE CHAIN

Marco Garcia Vaquero

Ireland

WGL7

Ivana Karabegovic

Republic of Serbia

WGVL7

Main objectives:

- Valorization of by-products, residues and food wastes along the entire production/commercial chain;
- Further valorization by their incorporation into new value chains: energy, agri-food and beverages, feed, nutraceuticals, pharmaceuticals and cosmetics.
- Impact on the promotion of environment, social and economic sustainable development, reduction of food wastes;

SOURDOMICS

WG8. FOOD SAFETY, HEALTH PROMOTING, SENSORIAL PERCEPTION AND CONSUMERS' BEHAVIOUR

Fatih Ozogul

Turkey

WGL8

Carole Prost

France

WGVL8

Main objectives:

- Development of sustainable packaging and edible films for preservation and extend shelf-life of sourdough bread and other baking goods by using eco-friendly materials and additives;
- Evaluation of the impact of sourdough microorganisms/metabolites/sourdough-based final products on:
  - Gut microbiome and mucosal immunity;
  - Chronic disease biology (inflammatory bowel disease, celiac disease, obesity and cancer);

SOURDOMICS

WG9. ECONOMIC FEASIBILITY, ENVIRONMENTAL SUSTAINABILITY, AND BUSINESS CASE DEVELOPMENT AND TEAM QUALIFICATION

Aleksandra Figurek

Bosnia and Herzegovina

WGL9

Alexandrina Sirbu

Romania

WGVL9

Main objectives:

- Development of new business models;
- Development of business cases and Economic Feasibility studies;
- Business qualification of farmers and companies
- Promotion of the environment, social and economic sustainable development

SOURDOMICS

DISSEMINATION, COMMUNICATION AND EXPLOITATION BOARD (DCEB): AWARENESS, IMPACT MAXIMIZATION AND RESEARCH DATA EXPLOITATION

Elena Velickova Nikova

North Macedonia

SCM

Tamara Dapcevic Hadnadjev

Republic of Serbia

GAC

Meleksen Akin

STSMC

Gül Ebru Orhun

Turkey

DCC

Jana Klopchevska

North Macedonia

WM

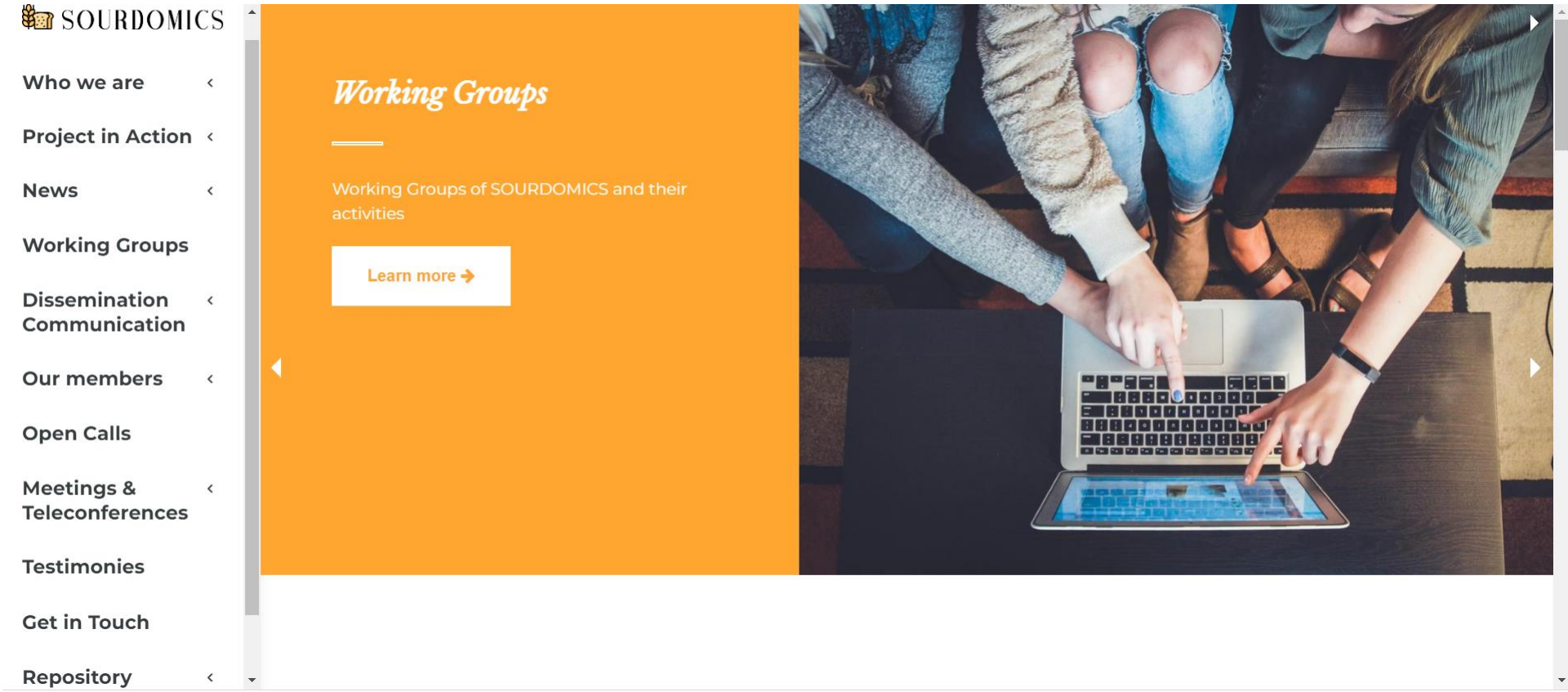
SOURDOMICS

Sourdough biotechnology network towards novel, healthier and sustainable food and bioprocesses

WEBSITE: https://sourdomics.com/

SOURDOMICS

Dissemination, Communication and Exploitation Board (DCEB): Awareness, impact maximization and research data exploitation



NETWORKING TOOLS AND ACTIVITIES

SOURDOMICS

Dissemination, Communication and Exploitation Board (DCEB): Awareness, impact maximization and research data exploitation

Deliverables x.3 = **Organization and promotion** of:

- Training schools (TS's)
- Short-Term Scientific Missions (STSM's)
- Inclusiveness Target Country conference grants (ITC conference grants)
- Organization or Dissemination of Scientific-technological events: Webinars, Congresses, Workshops, *etc*
- On-site, and e- and b-online (advanced) courses
- Meetings (CGM, MCM, intra-WGM, DCEBM, *etc*)
- Others

NETWORKING TOOLS AND ACTIVITIES

SOURDOMICS

Dissemination, Communication and Exploitation Board (DCEB). Awareness, impact maximization and research data exploitation

Deliverables x.4 and Deliverables x.5 = **Edition or Publication**:

- Support costs of Article Processing Charges (APC's) for open-access publications
- Books: 6 ongoing edition of books
- Different type of publications: manuscripts, journal special issues, chapters in books. JOINT/COLLABORATIVE RESEARCH PAPERS
- Collaborative scientific project proposals
- Others

SOURDOMICS

WWW.SOURDOMICS.COM

THANK YOU SO MUCH!

BRIAS WORKSHOP W05
FOOD FERMENTATION AND HUMAN HEALTH

03TH MARCH 2023, BRUSSELS, BELGIUM

ULB BrIAS VUB

cost EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

SOURDOMICS
Sourdough biotechnology network towards novel, healthier and sustainable food and bioprocesses