

Judicial Opinions 123–127

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Abstract

Opinion 123 places the epithet of the name *Aeromonas punctata* on the list of rejected epithets and clarifies the citation of authors of selected names within the genus *Aeromonas*. Opinion 124 denies the request to place *Borrelia* on the list of rejected names because the request is based on a misinterpretation of the Code, which is clarified. There are alternative ways to solve the perceived problem. Opinion 125 denies the request to place *Lactobacillus fornicalis* on the list of rejected names because the provided information does not yield a reason for rejection. Opinion 126 denies the request to place *Prolinoborus* and *Prolinoborus fasciculus* on the list of rejected names because a relevant type strain deposit was not examined. Opinion 127 grants the request to assign the strain deposited as ATCC 4720 as the type strain of *Agrobacterium tumefaciens*, thereby correcting the Approved Lists. These Opinions were ratified by the voting members of the International Committee on Systematics of Prokaryotes.

OPINION 123

Holmes and Farmer [1] made a request to the Judicial Commission:

- (1) To issue a Judicial Opinion correcting the type strain of *Aeromonas punctata* (Zimmermann 1890) Snieszko 1957 (Approved Lists 1980) and of *Aeromonas punctata* subsp. *punctata* (Zimmermann 1890) Schubert 1964 from ATCC 15468^T to NCMB 74^T.
- (2) To state the correct author citations for several *Aeromonas* names.

The second part of the request aims to ensure that the citations are complete enough to give good traceability through the names's history, but implies no change in the nomenclatural or taxonomic status of any name. On the contrary, the first part of the request is intended to have one desired consequence, which is solving a case of homotypic synonymy created by the introduction of an apparent error in the Approved Lists [2]. However, in doing this a new case of undesired homotypic synonymy is created, so the authors presented an accompanying paper [3] with an additional Request for an Opinion to solve this 'new' problem.

Evidence that the issue has been known for a long time can be found in the minutes of several meetings of the Subcommittee on the Taxonomy of *Vibrionaceae* (since 2005, *Aeromonadaceae*, *Vibrionaceae* and related organisms) [4–9] and the case is extensively documented in both Requests for an Opinion [1, 3]. So, here we will try to summarize the data that are necessary for understanding the nature of the problems focusing on the strains:

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Abbreviations: ANI, average nucleotide identity; dDDH, digital DNA–DNA hybridization; ICNP, International Code of Nomenclature of Prokaryotes; IJSEM, *International Journal of Systematic and Evolutionary Microbiology*.

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- Strain ATCC 15468^T was given as the type strain for *A. punctata*, *A. punctata* subsp. *punctata* and *A. punctata* subsp. *caviae* (Scherago 1936) Schubert 1964 (Approved Lists 1980) in the Approved Lists [2], making them homotypic synonyms. This is an unfortunate error because the publication that provides their description, the eighth edition of *Bergey's Manual* [10], gives NCMB 74^T as neotype strain for *A. punctata* and *A. punctata* subsp. *punctata*, and ATCC 15468^T as type strain for *A. punctata* subsp. *caviae*. It is important to stress not only that they are different strains with different origins but also to notice that NCMB 74^T is quoted as neotype strain, not type strain.
- Strain NCMB 74^T was designated as type strain of *Aeromonas eucrenophila* Schubert and Hegazi 1988 [11], meaning that if the aforementioned error in the Approved Lists gets corrected a new case of homotypic synonymy arises, this time between *A. punctata* (including also *A. punctata* subsp. *punctata*) and *A. eucrenophila*. It is important to notice that the first author of *A. eucrenophila* [11] is also the author of the monograph on *Aeromonas* [10] and one of the attendees listed in the minutes of the 1986 subcommittee meeting [4].

It has to be clarified that there is nothing problematic in homotypic synonyms. They are defined in Rule 23a of the International Code of Nomenclature of Prokaryotes (ICNP) [12] and mentioned in other parts. However, they can be a problem if caused by an error, as in the first instance, or when the priority favours a name that is perceived as problematic by some authors, as in the second instance. Indeed, Farmer and Holmes [3] make a strong case against *A. punctata*, presenting eight reasons in their Request for Opinion.

Altogether, the nomenclatural actions proposed are intended to:

- (a) Correct the error introduced in the Approved Lists [2] and designate strain NCMB 74^T as nomenclatural type of *A. punctata* (and *A. punctata* subsp. *punctata*).
- (b) Conserve the name *A. eucrenophila* over the name *A. punctata* (i.e., conserve the epithet *eucrenophila* over the epithet *punctata* in these names).
- (c) Reaffirm that NCMB 74^T is the type strain of *A. eucrenophila*.
- (d) Place the name *A. punctata* on the list of rejected names (i.e., place the epithet *punctata* in this name on the list of *epitheta specifica et subspecifica rejicienda*).

Action (a) was requested by Holmes and Farmer [1] while actions (b)–(d) were proposed by Farmer and Holmes [3]. Notably, the last of these actions would make the other three unnecessary. This can be easily explained: if *A. punctata* was rejected there would be no point in designating a type strain for it even if this was done to correct a previous mistake. Also, it means there would be no name competing in priority with *A. eucrenophila* and hence no need to call for conservation of the latter. An example of this point of view about the handling of a simultaneous request to conserve one name and reject a competing one is found in Opinion 106 [13]. Likewise, there would be no need to reaffirm that NCMB 74^T is the type strain of *A. eucrenophila* because it would be the only name available for use and holding that strain as nomenclatural type.

Hence, actions (a)–(c) make sense only if (d) is not approved. Moreover, (b) and (c) are very much interlinked, as it is difficult to envisage that a resolution may favour one and not the other. Moreover, they both depend on the outcome of (a).

Farmer and Holmes [3] invoked case (1) of Rule 56a, ambiguous name (*nomen ambiguum*), for rejecting *A. punctata*. In their request they present eight reasons arranged chronologically to support all actions outlined above as (c)–(d) but reasons 1–5 are particularly strong arguments for rejection.

Placing the epithet *punctata* in the name *Aeromonas punctata* (Zimmermann 1890) Snieszko 1957 (Approved Lists 1980) on the list of *epitheta specifica et subspecifica rejicienda* has consequences for the names *A. punctata* subsp. *punctata* (Zimmermann 1890) Schubert 1964 (Approved Lists 1980) and *A. punctata* subsp. *caviae* (Scherago 1936) Schubert 1964 (Approved Lists 1980): none of the three names would be available for use any longer. According to Judicial Opinion 106 [13], this would equally apply to every validly published new combination for *A. punctata*. In contrast, *A. caviae* (Scherago 1936) Popoff 1984 would not be affected.

Holmes and Farmer [1] further requested a clarification of the way names of selected species of *Aeromonas* are to be cited. They emphasize:

‘We believe that the citation should be complete enough to include all critical information and allow the reader to trace a sometimes confusing history.’

However, in contrast to the suggestions given in the request [1] the Judicial Commission sees no possibility to overrule Section 6 of the ICNP [12], which restricts the citation of names and their authorities. Additional information, such as details on the type strains, can be given elsewhere at any time.

The citations of the names of interest would accordingly be:

- *Aeromonas hydrophila* (Chester 1901) Stanier 1943 (Approved Lists 1980)
- *Aeromonas punctata* (Zimmermann 1890) Snieszko 1957 (Approved Lists 1980) nom. rej.
- *Aeromonas punctata* subsp. *punctata* (Zimmermann 1890) Schubert 1964 (Approved Lists 1980) nom. rej.

- *Aeromonas punctata* subsp. *caviae* (Scherago 1936) Schubert 1964 (Approved Lists 1980) nom. rej.
- *Aeromonas caviae* (Scherago 1936) Popoff 1984

The optional 'nom. rej.' (or 'nom. rejic.') is not covered by Section 6 but can be used as abbreviation for '*nomen rejiciendum*'. The basonyms of these names are '*Bacillus hydrophilus*' Chester 1901, '*Bacillus punctatus*' Zimmermann 1890 and '*Pseudomonas caviae*' Scherago 1936, respectively. These are examples of names whose authors are given by the Approved Lists [2] in parentheses but are not listed as approved names. For this reason, these basonyms are not validly published themselves. *Aeromonas caviae* was thus a new combination: the epithet *caviae* in this name and its homotypic synonyms was available for use due to its inclusion in the Approved Lists and did not need to be revived; see also Rule 33d [12].

The commissioners unanimously decided to reject *A. punctata* because it is considered a *nomen ambiguum* as defined in Rule 56a(1). It was also ruled that this makes it unnecessary to address the correction of the type strain designated in the Approved Lists for this organism or any other action regarding *A. caviae* or *A. eucrenophila*, as *A. punctata* may no longer be considered a homotypic synonym of any of them. That is, a correction of the Approved Lists to designate strain NCMB 74^T (and known equivalent designations) as type strain of *A. punctata* was not conducted, and it was not ruled that *A. eucrenophila* is conserved over *A. punctata*. It was unanimously decided that these actions would be conducted if and only if the request to reject *A. punctata* had been denied. The commissioners also unanimously decided that the authorship citations for the names of interest are proposed as given above.

OPINION 124

Margos *et al.* [14] request the placement of the genus name *Borrelia* Adeolu and Gupta 2015 [15, 16] and the names of all of its species on the list of *nomina rejicienda*. Several reasons were given for the rejection of these names in the Request for an Opinion [14]. It was claimed that the *Borrelia* names are *nomina periculosa* according to Rule 56a of the International Code of Nomenclature of Prokaryotes or ICNP [12] and that they violate Principle 1(1), Principle 1(3) and Principle 9 of the ICNP.

Members of the Judicial Commission contacted the authors of the request in the meantime and one (M.G.) has published on alternative solutions for the perceived problem [17]. However, the Judicial Commission takes issue with the interpretation of the ICNP given in the request, which requires clarification. Judicial Opinion 122 [18] treated a similar case, i.e., the request to reject names of *Mollicutes* that were proposed as the result of a taxonomic revision [19]. That Request for an Opinion had to be denied because it was based on a misinterpretation of the ICNP that has much in common with the reasoning treated here [14]. Since much of the relevant argumentation was provided in Opinion 122 [18], the request by Margos *et al.* [14] can be treated more briefly.

First, the *Borrelia* names are not *nomina periculosa* according to Rule 56a(5) because the Note to this Rule clearly indicates that the term only applies to the occasional need to distinguish neighbouring species as *nomenspecies* (species by name only). Irrespective of any safety concerns expressed in the Request for an Opinion [14], Rule 56a(5) does not cover the case of validly published new combinations proposed as a replacement for validly published species names. The same point was made in Judicial Opinions 121 and 122 [18].

Second, the *Borrelia* names do not contravene Principle 1(1). While the ICNP [12] does aim at the stability of names, this aim must be seen in the context of the entire Principle 1, which actually lists four distinct aims that have equal weight. In particular, Principle 1(4) guarantees taxonomic freedom, much like General Consideration 4, Principle 8 and Principle 9, if properly understood. The same point was made in Judicial Opinion 122 [18].

Third, the *Borrelia* names do not contravene Principle 1(3) since the ICNP [12] does not regard names that are the result of a taxonomic study as useless. In contrast, the taxonomic view that certain species should be placed in another genus *must* be expressed by creating new combinations (or rarely *nomina nova*), as stipulated by Rule 37b(2) in conjunction with Rule 41; Principle 8 and Rule 23a are also of relevance here. The same point was made in Judicial Opinion 122 [18].

Fourth, the *Borrelia* names do not contravene Principle 9. This principle provides two sufficient reasons for changing a name. One of them is a taxonomic revision. The *Borrelia* names undoubtedly originate from such a taxonomic revision [15]. According to Principle 1(4) and General Consideration 4 this holds irrespectively of whether or not other parties agree with that taxonomic revision. The same point was made in Judicial Opinion 122 [18].

Finally, it should be pointed out that the rejection of the *Borrelia* names would not ultimately have the desired effect. As long as the *Borrelia* names are validly published and available for use, the name of another genus that contained the type species of *Borrelia* would, once validly published, contravene Rule 51b. The species names within this hypothetical genus were thus illegitimate and could not be used (Rule 51a) and in particular could not be considered the correct name of any species (Rule 23a), irrespectively of taxonomic opinion. If, however, the name *Borrelia* was placed on the list of rejected names, it would not be available for use any longer. Thus another genus name with the same circumscription as *Borrelia* could be proposed and validly published, and be legitimate, and the validly published species names within this hypothetical genus could be considered

the correct names, depending on taxonomic opinion [20]. The *Borrelia* names block such attempts as long as these names remain available for use.

For this reason, the issue regarded in the Request for an Opinion [14] as the main problem of the *Borrelia* names, i.e., that they constitute validly published synonyms of validly published *Borrelia* names, and that the former may accordingly be used in place of the latter, cannot really be solved by rejecting *Borrelia*. A future taxonomic revision could simply generate other validly published synonyms of the validly published *Borrelia* species names that now have validly published synonyms placed within *Borrelia*. This could only be prevented by rejecting the epithets in the *Borrelia* names, as opposed to rejecting just the name *Borrelia*. However, as clarified in Judicial Opinion 106 [13], this would implicitly reject their respective synonyms within *Borrelia*, presumably not an outcome the authors of the Request for an Opinion [14] would support. The same can be said for the names of *Mollicutes* whose rejection was requested elsewhere [19]. This again illustrates that the rejection of names under the ICNP [12] is not a means of solving taxonomic controversies [18].

Margos *et al.* [14] further claimed that the ‘genus *Borrelia* is currently validated in its original form’ by referring to a List of Changes in Taxonomic Opinion [21] that listed an emendation of the genus *Borrelia* [22] with the intention to restore its original scope, including all species placed in *Borrelia* [15, 16]. However, apart from Rule 35, which provides recommendations for citing authors of emendations, the ICNP [12] does not regulate emendations of the descriptions of taxon names. In contrast, the first sentence of Rule 37b, one of the statements which implement Principle 1(3), emphasizes that an emendation does not warrant the change of a name. Thus, the emendation of a taxon description is not a nomenclatural act even though it is often welcome from a taxonomic perspective. The publication of a List of Changes in Taxonomic Opinion in the *International Journal of Systematic and Evolutionary Microbiology* (IJSEM) is intended as a service to the community but does not have a role in nomenclature (although it certainly does have a role in taxonomy).

It should also be noted that the verb ‘validated’ hardly occurs in the ICNP [12]; it is reasonable to assume that it refers to the action conducted by the inclusion of a name in a Validation List as stipulated by Rule 27. The inclusion in a Validation List is neither a necessary nor a sufficient condition for a name to be validly published [12, 13]; it is a necessary condition for the valid publication of names that were proposed in an effective publication outside the IJSEM. To ‘validate’ a name would thus be only one of the two possible mechanisms to make this name validly published according to Rule 27. In any case, the genus name *Borrelia* was not ‘validated’ a second time.

In contrast, the valid publication of the new combinations in the genus *Borrelia* [15, 16] for validly published *Borrelia* species names did not render these unavailable for use, i.e. these *Borrelia* species names remained validly published and legitimate [18]. Scholars who prefer *Borrelia* in its original circumscription can still use the *Borrelia* synonyms of the *Borrelia* names and nevertheless be in accordance with the ICNP [20].

Accordingly, the perceived problem regarding the *Borrelia* names is actually restricted to the use of these names in publications and particularly in public databases [17]. The curators of some public databases may misunderstand the ICNP as indicating that the latest validly published name must be treated as the correct name, or may just regard this as a database policy to be followed [18]. Fixing this issue, if it is perceived to be problematic, is a matter of negotiation with these public databases [17]. It does not have a direct connection to the ICNP [12], which does not regulate taxonomy.

For the reasons given above, the Judicial Commission does not consider it possible to grant this Request for an Opinion. As in the case of Opinion 122, this conclusion can, and has to, be reached without resorting to any consideration of the taxonomic merits (or lack thereof) of the underlying work [15]. The Judicial Commission thus voted to deny this request [14]. This solution was favoured by eleven commissioners; one commissioner abstained.

OPINION 125

Gonçalves Ribeiro *et al.* [23] request the clarification of the status of the name *Lactobacillus fornicalis* Dicks *et al.* 2000 [24] and its placement on the list of rejected names. While this name indeed needs to be revisited, the Judicial Commission takes issue with some misinterpretations of the ICNP [12] found in this request.

First, the request [23] incorrectly cites Rule 18g, since the unsuitability of a type strain is distinct from its unavailability; see also Opinion 100 [25]. In order to be recognized as being unsuitable, a type strain must be available in the first place.

Second, the request [23] incorrectly cites Rule 30. As of 1 January 2001, Rule 30(3)(b) applies, which only specifies that evidence must be provided that the deposits which represent the type strain in at least two culture collections ‘are present, viable, and available at the time of publication.’ The name *Lactobacillus fornicalis* Dicks *et al.* 2000 is not affected by Rule 30(3)(b) but by Rule 30(3)(a), which in conjunction with Rule 18a(1) indicates that a deposit of the type strain with this name in at least one culture collection is necessary for its valid publication. In either case, the name of a species or subspecies that is validly published and legitimate would not lose this status because of the later loss of its type strain deposits.

Precisely for this reason, the ICNP provides two alternatives for names of species or subspecies whose type strain deposits were available but became unavailable: the assignment of a neotype strain (Rule 18c) or the rejection of the name or epithet according to Rule 56a(2). As these two approaches are mutually exclusive, 'the rejection of the species name, at least until a neotype strain will be proposed' as suggested in the request [23] is not feasible. The ICNP does not mention a mechanism for 'unrejecting' a name once it was placed on the list of rejected names, as already noted in Opinion 121 [18], although a revision of a Judicial Opinion was made in the past [26]. The ICNP does not appear to provide a means for making a name *temporarily* unavailable, and such an approach seems to be incompatible with Principle 1 [12].

The request [23] is based on the observation that the 16S rRNA gene sequences obtained from the alleged type strain deposits of *Lactobacillus fornicalis* Dicks et al. 2000 show a low similarity to the sequence Y18654, which was provided together with the original description [24]; instead these latter sequences exhibit a high similarity to the 16S rRNA gene sequence of the type strain of *Lactobacillus plantarum* (Orla-Jensen 1919) Bergey et al. 1923 (Approved Lists 1980) [2, 27] \equiv *Lactiplantibacillus plantarum* (Orla-Jensen 1919) Zheng et al. 2020 [28]. This is an insight that is certainly worth reporting but its relationship to the possible reasons for rejecting a name needs to be clarified.

The proposal of *Lactobacillus fornicalis* Dicks et al. 2000 is based on a designated description section (as defined in Rule 27 [12]) but this section does not list a 16S rRNA gene sequence, hence sequence information is not a part of the taxon description, although the gene was analysed. The possibility that the 16S rRNA gene sequence reported by Dicks et al. [24] was erroneous cannot readily be excluded. In order to demonstrate that *Lactobacillus fornicalis* Dicks et al. 2000 is not validly published it must be demonstrated that the deposits listed in the original description did not represent the type strain whose properties were reported in the description; hence one of the following two statements must be proven:

1. The discrepancies between the description of *Lactobacillus fornicalis* Dicks et al. 2000 and the known features of its type strain deposits that were listed in the original publication are so profound that they cannot be attributed to experimental error or experimental variability.
2.
 - (a) The type strain deposits of *Lactobacillus fornicalis* Dicks et al. 2000 that were listed in the original publication belong to another species, and
 - (b) the discrepancies between the description of *Lactobacillus fornicalis* and the description (or, if necessary, the known features) of this other species are so profound that they cannot be attributed to experimental error or experimental variability or intraspecific variability.

It should further be noted that if the name *Lactobacillus fornicalis* Dicks et al. 2000 was not validly published, its placement on the list of rejected names would be pointless [13, 29]. If, in contrast, the name was validly published, then there must have been at least one deposit that actually represents the type strain. If so and if at least one of those deposits, or a deposit that was derived from one of them (see the Note to Rule 18c [12]), remained available, then a neotype strain would not need to be assigned. *Lactobacillus fornicalis* Dicks et al. 2000 would simply be a later heterotypic synonym of *Lactobacillus plantarum* (Orla-Jensen 1919) Bergey et al. 1923 (Approved Lists 1980).

Unfortunately, the Request for an Opinion [23] only provides evidence for statement 2(a); it neither provides evidence for statement 1 nor for statement 2(b). Similar problems with 16S rRNA gene sequence based requests were observed previously [13, 18]. The Judicial Commission thus attempted to collect additional information although this information should have been provided in the request. In particular, the culture collections harbouring the alleged *Lactobacillus fornicalis* type strain deposits (ATCC 700934^T, CCUG 43621^T, CIP 106679^T, DSM 13171^T and JCM 12512^T) were contacted.

The JCM responded that the 16S rRNA gene sequence for JCM 12512^T does not fit to Y18654 but does not have phenotypic data for the deposit, which was obtained from CIP (Mitsuo Sakamoto, personal communication, 9 June 2022). The JCM catalogue further indicates that CIP 106679^T was directly obtained from Dr. Dicks. The sequence AB290883, obtained from JCM 12512^T, confirms the mismatch; it shows a high similarity to EF468099, obtained from the type strain of *Lactobacillus plantarum*.

The ATCC catalogue indicates that ATCC 700934^T was deposited by Dr. Dicks and that 16S rRNA gene sequencing pointed to a strain of *Lactobacillus plantarum*. This was confirmed by ATCC staff (Shimaz Hashimdeen, personal communication, 13 June 2022); apparently ATCC 700934^T showed 99.97% 16S rRNA gene sequence similarity to ATCC 14917^T, a type strain deposit of *Lactobacillus plantarum*. Moreover, it was reported that ATCC 700934^T tested positive for both lactose fermentation and nitrate reduction although *Lactobacillus fornicalis* should test negative for these reactions [24].

Information from CIP staff (Estelle Boulanger and Olivier Chesneau, personal communication, 13 June 2022) indicated that CIP 106679^T was deposited as TV 1018^T in 2000 by Dr. Dicks himself. The 16S rRNA gene sequence obtained from CIP matched EF468099, consistent with an affiliation of the CIP deposit to *Lactobacillus plantarum*. The received CIP data sheet for the deposit indicated partial agreement of the physiological properties with the description of *Lactobacillus fornicalis* [24] and partial

agreement with the description of *Lactobacillus plantarum* [27]. In the case of the latter the deviations may be due to intraspecies variability.

The request [23] indicated that the DSMZ deposit DSM 13171^T, which was at the time of writing not shown in the DSMZ online catalogue, was also identified as a strain of *Lactobacillus plantarum*. The DSMZ curator for *Lactobacillus formicilis* re-examined the deposit when contacted by the Judicial Commission. The partial 16S rRNA gene sequence newly obtained from DSM 13171^T did in many areas not match Y18654 (Rüdiger Pukall, personal communication, 28 June 2022). However, it was nearly identical to AB290883, which was obtained from JCM 12512^T. In contrast to the description of *Lactobacillus formicilis* [24], DSM 13171^T tested positive for rhamnose and lactose in the API 50CH assay. DSM 13171^T was also positive for gentibiose, turanose, *N*-acetylglucosamine and methyl α -D-mannopyranoside, which were not mentioned earlier [24]. The DSMZ deposit of the reference strain TV 1010 (DSM 13172) mentioned in original publication on *Lactobacillus formicilis* [24] is not available in the DSMZ catalogue either.

The response from CCUG to the enquiry by the Judicial Commission confirmed the CCUG catalogue, which indicates that CCUG 43621^T was deposited by Dr. Dicks, and that the 16S rRNA gene sequence obtained did not match the original sequence, and that the strain was assigned to *Lactiplantibacillus plantarum* \equiv *Lactobacillus plantarum* (Edward R.B. Moore, personal communication, 29 July 2022). CCUG had also conducted sequencing of housekeeping genes, which confirmed the assignment. Several e-mails had been exchanged between collection which allegedly harboured *Lactobacillus formicilis* but apart from adding according notes to the catalogues or removing entire entries from the catalogues no formal action was taken. Moreover, CCUG 44494, also originating from Dr. Dicks' laboratory, was received as *Lactobacillus formicilis* but had to be assigned to *Lactobacillus jensenii* [2, 30] after quality control.

These data do not prove, but are compatible with, the identity of all available type strain deposits of *Lactobacillus formicilis*. In particular, the 16S rRNA gene sequence results uniformly point to a strain of *Lactobacillus plantarum*. This would in turn indicate that the deposited cultures either uniformly fail to represent the type strain used in the original description [24], in which case the name *Lactobacillus formicilis* Dicks et al. 2000 was not validly published, or uniformly represent this type strain, in which case the name was validly published and just the published 16S rRNA gene sequence Y18654 originated from another strain. Few properties listed in the original or emended descriptions of the species point to profound differences; the G+C content may be one of them, as may be physiological properties such as those listed above. Distinguishing between the two options is thus not easy although the overall results may indicate that *Lactobacillus formicilis* Dicks et al. 2000 does not meet the requirements laid out in Rule 30 [12]. However, in either case there was no reason for placing *Lactobacillus formicilis* Dicks et al. 2000 on the list of *nomina rejicienda*. There is no evidence for a situation in which a correctly deposited type strain is not available any longer (in conjunction with a low likelihood of being able to assign a neotype strain).

The Judicial Commission thus decided to deny the request [23] to reject the name *Lactobacillus formicilis* Dicks et al. 2000. This solution was favoured by all commissioners. The issue could be reconsidered in the future if more information is provided, particularly regarding the comparison of the original description of *Lactobacillus formicilis* to the known features of *Lactobacillus plantarum*.

OPINION 126

Glaeser et al. [31] request the placement of the names *Prolinoborus* Pot et al. 1992 and *Prolinoborus fasciculus* (Strength et al. 1976) Pot et al. 1992 [32] on the list of rejected names, provided that a neotype strain for *Prolinoborus fasciculus* cannot be assigned within a 2-year period after issuing the Request for an Opinion. This amounts to a misunderstanding of Rule 18c [12] that was already highlighted elsewhere [13, 18, 33]. The authors [31] also incorrectly refer to Recommendation 20d(3) because this clause deals with the selection of the type species when proposing a new genus and does not provide a reason for rejection; see also General Consideration 6(3) [12]. Moreover, the description of its type species *Prolinoborus fasciculus* apparently cannot disagree with the one of the monotypic genus *Prolinoborus*. However, the two names (and accordingly *Aquaspirillum fasciculus* Strength et al. 1976 [2, 34]) should indeed be revisited.

Unfortunately, the Request for an Opinion [31] only provides considerable evidence to demonstrate that *Prolinoborus fasciculus* (Strength et al. 1976) Pot et al. 1992 is a later heterotypic synonym of the species *Acinetobacter lwoffii* (Audureau 1940) Brisou and Prévot 1954 (Approved Lists 1980) [2] although this observation by itself is just an issue of taxonomy, on which the ICNP does not rule. The authors [31] neglect the question of whether or not this observation indicates that the type strain of *Prolinoborus fasciculus* was indeed not originally deposited in a culture collection, in which case the species name was not validly published [12, 13, 29], which would also render the name of the genus not validly published. The lack of information in the request is similar to the situation treated in Judicial Opinion 125.

Another problem is the selection of deposits investigated. It is not clear why the authors [31] claim that ATCC 27740^T is no longer available; at the time of writing of this manuscript (9 June 2022) the deposit was listed in the ATCC online catalogue. The Judicial Commission could confirm, however, that LMG 12892^T is indeed not listed in the LMG catalogue. Yet this does not rule out that

LMG 12892^T was available at the time of publication. Moreover, in the case of *Prolinoborus fasciculus* (Strength et al. 1976) Pot et al. 1992 [32] and *Aquaspirillum fasciculus* Strength et al. 1976, which were published prior to 2001, only one type strain deposit was required since as indicated in Rule 30(3)(a) in conjunction with Rule 18a(1) [12].

The Request for an Opinion [31] and the studies cited by it are based on an examination of CIP 103579^T. In contrast to ATCC 27740^T, CIP 103579^T was not mentioned in the original descriptions of *Prolinoborus fasciculus* (Strength et al. 1976) Pot et al. 1992 [32] and *Aquaspirillum fasciculus* Strength et al. 1976 [2, 34]. It is thus of primary relevance whether the features of ATCC 27740^T fitted to these original descriptions. These descriptions apparently conflict with the descriptions of *Acinetobacter* Brisou and Prévot 1954 [35] and *Acinetobacter lwoffii* (Audureau 1940) Brisou and Prévot 1954 (Approved Lists 1980) emend. Bouvet and Grimont 1986 [36] regarding features such as cell morphology, motility, and G+C content. However, no evidence was provided in the request [31] for a conflict between the descriptions of *Prolinoborus fasciculus* and *Aquaspirillum fasciculus* on the one hand and the features of ATCC 27740^T on the other hand. In contrast, the ATCC catalogue reports flagellar activity for ATCC 27740^T, which would distinguish it from *Acinetobacter lwoffii* [36]. For these reasons, it cannot be ruled out that CIP 103579^T represents *Acinetobacter lwoffii* but is just not identical to ATCC 27740^T.

The Judicial Commission thus decided to deny the request [31] to reject the names *Prolinoborus fasciculus* (Strength et al. 1976) Pot et al. 1992 and *Prolinoborus* Pot et al. 1992. This solution was favoured by all commissioners. The issue could be reconsidered in the future if more information is provided, particularly regarding discrepancies, if any, between ATCC 27740^T and the features of *Prolinoborus fasciculus* listed in the original description [32].

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In the Request for an Opinion by Velázquez et al. [37], the assignment of the type strain ATCC 23308^T to the species *Agrobacterium tumefaciens* (Smith and Townsend 1907) Conn 1942 (Approved Lists 1980) [2, 38], the type species of the genus *Agrobacterium* Conn 1942 (Approved Lists 1980) [2, 38], is challenged due to a strain replacement that happened upon the inclusion of the species name in the Approved Lists [2]. The authors [37] call for returning the type strain status to the original strain ATCC 4720, which had been associated as nomenclatural type with this species according to the eighth edition of *Bergey's Manual* [39], to which the Approved Lists were explicitly referring regarding the description of *A. tumefaciens*.

The Judicial Commission could confirm the alleged literature statements and could also confirm that subcultures of strain ATCC 4720 (=A1) are currently available, as indicated in the Request for an Opinion [37], in several culture collections under the following identifiers: ATCC 4720=CIP 104335=CCM 1000=CCUG 3555=CIP 104335=DSM 30150=ICMP 5793=LMG 182=NCIMB 8150=CFBP 2412=NCPPB 2992.

It is not the first time that *A. tumefaciens* is the subject of a Judicial Opinion [40, 41]. According to current taxonomic opinion, *A. tumefaciens* is a synonym of *A. radiobacter* (Beijerinck and van Delden 1902) Conn 1942 (Approved Lists 1980) [2, 38]. Since the epithet *radiobacter* has priority over *tumefaciens*, *A. tumefaciens* cannot be the correct name under these circumstances (Rule 23a), which led to confusion regarding the status of *A. tumefaciens* as type species of *Agrobacterium*. However, Rule 15 is unambiguous in this respect, and the Judicial Commission maintained several times that a name needs not be regarded as the correct name to serve as nomenclatural type; this issue was mentioned most recently in Opinion 111 [18].

Intriguingly, past debates on the status of *A. tumefaciens* did not cover the exchange of type strains in the Approved Lists. However, phylogenetic analyses performed by Velázquez et al. [37] showed that strains ATCC 23308^T and ATCC 4720 belong to different species according to current taxonomic approaches and that *A. tumefaciens* would not be regarded as later synonym of *A. radiobacter* if the type strain of *A. tumefaciens* was ATCC 4720.

Velázquez et al. [37] performed MALDI-TOF MS comparisons among the following strains: ATCC 23308^T and ATCC 4720 on the one hand and deposits ATCC 19358^T and NCIB 9042^T of *Agrobacterium radiobacter* (Beijerinck and van Delden 1902) Conn 1942 (Approved Lists 1980) [2, 38] on the other hand. NCIB 9042^T was included in the analyses because the type strain of *A. radiobacter* was also replaced upon inclusion in the Approved Lists, albeit with an equivalent strain. MALDI-TOF MS spectra appeared to be similar and showed score values indicating that all those strains belong to the same species with the exception of ATCC 4720. This in turn indicates that the replacement of the type strain of *A. radiobacter* did not affect its identity while the replacement of the type strain of *A. tumefaciens* clearly did.

The authors of the Request for an Opinion further compared 16S rRNA gene sequences as well as *atpD* and *recA* gene sequences amplified from the above strains and sequenced in the course of the study [37]. The 16S rRNA gene sequencing results confirmed the affiliation of the strains ATCC 23308^T, NCIB 9042^T and ATCC 19358^T to the same species (100% similarity), which the authors treated as *A. radiobacter*, while strain ATCC 4720 apparently belonged to a different species and showed 100% identity with *A. arsenijevicei* Kuzmanović et al. 2019 [42, 43] and *A. fabacearum* Delamuta et al. 2020 [44]. Phylogenetic analyses of *atpD* and *recA* gene sequences apparently also supported the affiliation of strain ATCC 4720 with *A. arsenijevicei* and *A. fabacearum* rather than with *A. radiobacter*.

Finally, Velázquez *et al.* [37] conducted a genomic comparison between the strains affiliated with *A. radiobacter* and *A. tumefaciens* as used in the 1974 edition of *Bergey's Manual* [39]. Only the genome sequences of ATCC 4720 and NCIB 9042^T were compared, as the authors opined that there was no further need to compare additional deposits, given the MALDI-TOF MS and single-gene comparison results. The average nucleotide identity (ANI) and digital DNA–DNA hybridization (dDDH) values between strains ATCC 4720 and NCIB 9042^T were both lower than the thresholds recommended for delineation of prokaryotic species, thus supporting the affiliation of the strains to different species according to current taxonomic standards. The Judicial Commission could confirm this result by comparing ATCC 4720 (GCF_011684035.1) with ICMP 5856^T=ATCC 23308^T (GCF_009498475.1). The FastANI and dDDH results again indicated that the strains belong to distinct species. Accordingly, the change proposed in the request [37] would indeed make a difference. New synonymies might arise (with *A. fabacearum*, *A. arsenijevicii*) but the well-known one to *A. radiobacter* might disappear.

For obvious reasons, the ICNP [12] contains a limited number of mechanisms for replacing the type strain of a species. The current type strain ATCC 23308^T of *A. tumefaciens* is available and its characteristics were not apparently changed; hence, neither Rule 18c (on designation of a neotype) nor Rule 18g (on strain replacement) can be applied here. However, the Judicial Commission can consider correcting the Approved Lists according to Rule 23a Note 4. As remarked in Judicial Opinion 80 [45], ‘a name (epithet) can only be conserved over another name (epithet) or in combination with a particular circumscription.’ Changing the type strain would constitute the conservation of a name with a distinct circumscription. The Judicial Commission has corrected the Approved Lists several times regarding the selection of type strains, namely in Opinions 59 [46], 64 [47], 65 [48], 66 [49], 68 [50], 76 [51], 87 [52], 91 [53] and 101 [25].

In fact, it remains unclear why the type strain of *A. tumefaciens* was replaced upon inclusion of the species name in the Approved Lists, particularly since its deposits were apparently available at that time. This could be considered to favour replacing the type strain although the one chosen by the Approved Lists was assigned for over four decades. In addition, the type strain proposed in the Request for an Opinion is widely available from culture collections [37]. According to current taxonomic views on species delineation the replacement may well render *A. tumefaciens* the correct name, particularly since it would remove the synonymy with *A. radiobacter*. This outcome may be seen as beneficial although from a nomenclatural viewpoint it is unnecessary since the status of *A. tumefaciens* as type species of *Agrobacterium* was never endangered.

The Judicial Commission thus decided to grant the request by Velázquez *et al.* [37] to replace the type strain of *Agrobacterium tumefaciens* and correct the type designation in the Approved Lists, based on the Note 4 of Rule 23a. This outcome was preferred by all commissioners.

A taxonomic consequence according to the currently prevailing views on species delineation would be that *A. tumefaciens* and *A. radiobacter* would not be considered heterotypic synonyms any longer. Moreover, researchers who preferred a broad view of the genus *Rhizobium* Frank 1889 (Approved Lists 1980) [2, 54] as put forward by Young *et al.* [55], i.e. including the genus *Agrobacterium*, would need to propose a new combination for *A. tumefaciens* that places it within *Rhizobium*.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

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