NOTE**Proposals to update and make changes to the Bacteriological Code**

B. J. Tindall

Tel: +49 531 2616 224. Fax: +49 531 2616 418. e-mail: bti@dsmz.de

DSMZ – Deutsche
Sammlung von
Mikroorganismen und
Zellkulturen GmbH,
Mascheroder Weg 1b,
D-38124 Braunschweig,
Germany

Keywords: Bacteriological Code, updating, revision, BioCode, nomenclature

The Bacteriological Code (Lapage *et al.*, 1992) is an important tool in prokaryotic taxonomy and is not a static instrument, but occasionally needs updating in order to deal with problems which have arisen, or may arise, which would have an adverse effect on the names of 'bacteria'. In order to address this task, the following notes have been prepared dealing with the way in which the Bacteriological Code may be modified to cater for various changes.

General Consideration 5

A note should be added stating that:

'The term "bacteria" covers those organisms variously recognized as prokaryotes, *Bacteria*, *Archaea*, *Eubacteria* and *Archaeobacteria*. Due consideration has been given to including cyanobacteria, which are traditionally covered by the International Code of Botanical Nomenclature, and has been discussed elsewhere'.

Principle 1

The Bacteriological Code does not explicitly define the independent functions of nomenclature and classification. The following should be added to Principle 1.

'(4) Nothing in this Code may be construed to restrict the freedom of taxonomic thought or action.'

Principle 2

A search of homonyms which occur between bacterial taxa, botanical taxa and zoological taxa is currently extremely small. Some of these, such as the genera *Stigmatella*, *Planctomyces*, etc., are due to these taxa being classified initially as fungi. In order to prevent the creation of further homonyms, it is proposed that the Bacteriological Code should no longer operate independently of the Zoological Code and International Code of Botanical Nomenclature. Similar proposals have been made for the International Code of Botanical Nomenclature (Anonymous, 1999) and is a step towards the harmonization of Codes of Nomenclature outlined by the BioCode (Greuter *et al.*, 1996). Virology does not generally use Latinized binomials for viral taxa, and does not currently present a problem in this respect. Principle 2 should be changed as follows:

'The nomenclature of bacteria is not independent of botanical and zoological nomenclature. When naming new taxa due consideration is to be given to avoiding names which are regulated by the Zoological Code and the International Code of Botanical Nomenclature.'

Note: although not complete, an extensive list of names of zoological taxa is maintained by the Zoological Record, a list of botanical taxa, including higher plants, algae, cyanobacteria, botanical protists and fungi is maintained by the *Index Nominum Genericorum* (ING), the *Names in Current Use* and the International Mycological Institute (*Index of Fungi*). A list of validly published bacterial names is available from the DSMZ (*Bacterial Nomenclature Up-to-Date*; <http://www.dsmz.de/bactnom/bactname.htm>) or from J. P. Euzéby's *List of Bacterial Names with Standing in Nomenclature* (<http://www-sv.cict.fr/bacterio/>).

Recommendation 30b

A note should be added to Recommendation 30b, since the purpose of minimal standards is to assist in the description of taxa, but not to hinder further developments in taxonomy. The following addition is proposed:

'The list of minimal standards is drawn up by groups of experts, and its aim is to provide guidance on the description of taxa for taxonomists seeking such advice. However, these standards are not to be applied in such a way as to contradict Principle 1(4).'

The term 'published' is used when 'effective and/or valid publication' is often implied. This can be misleading, since the publication of a name as defined under Rule 25b does not constitute 'effective publication' as defined by the Bacteriological Code. In order to avoid misunderstandings, the following changes are proposed:

Rule 12a

'If the words were not joined in the effective publication ...'

Rule 18b

'If the author in the effective or valid publication ...'

Rule 20b

'If the author of the effective or valid publication ...'

Rule 20e

'(1) If none of the species named by an author in the effective or valid publication ...'

Rule 20f

'The valid publication of a new generic name ...'

Rule 24b

'(1) ... the priority shall be determined by the date of the effective publication ...'

'(2) ... priority is determined by the date of valid publication of the name ...'

Rule 25a

'... it is recommended that the author(s) include in the effective publication a description in a more familiar language.'

Rule 27 (3) Note

'The date of valid publication is that of publication in the IJSB. The name may be mentioned in a previous effective publication ...'

Also in the last paragraph the following change should be made:

'... a type must be designated in the effective or valid publication.'

Rule 28a (Note 1)

'Valid publication of a new name is not invalidated by previous effective publication ...'

Rule 28a (Note 2)

'... they require valid publication, and the date of priority of publication of a revived name is that of valid publication in the IJSB (see Rule 27).'

Rule 27 (Note)

If the initial proposal of a new name or a new combination is not effectively published in the IJSB, valid publication (announcement in a Validation List) ...'

Section 5 is divided into two sections. Although these nominally are divided into sections 'A. Priority of Names' and 'B. Publication of Names', Rule 24b, under Section 5B, also deals with priority of names. Unless the Bacteriological Code is reorganized it is suggested that these two headings be removed and the header of Section 5 be changed to:

'Section 5: Priority, effective and valid publication of names'

Due consideration should be given to the fact that a system of registration is being proposed for the International Code of Botanical Nomenclature (Anonymous, 1999). The proposal suggests that the date of receipt for registration be used to determine priority of publication. Although priority of names as determined for bacteria does not currently need to be handled in this fashion, should this proposal become effective in the International Code of Botanical Nomenclature, it may prove prudent to introduce a similar system for names appearing on the Validation Lists. This could be achieved by appropriate rewording of Rules 24b and Rule 27.

Rule 31a

Rule 31a is ambiguous since it does not clearly make the distinction between studies on a mixed culture (or more than one organism) which was not recognized as such, and studies on defined mixed cultures, in which only one component is clearly designated as representing the new species or subspecies (i.e. in the case of syntrophic taxa). The following change is proposed:

'The name of a species or a subspecies is not validly published if the description is demonstrably ambiguous and cannot be critically identified for purposes of the precise application of the name of a taxon.'

Note. If the description is (not knowingly) based on upon the properties of more than one organism, a mixed culture, or on more than one component of a defined co-culture, then the taxon being described will have properties which refer to more than one organism and can not be considered to be validly published. If the taxon being described is part of a mixed culture or a defined co-culture, but is unambiguously applied to only one component (i.e. as in many syntrophic bacteria), which may be identified by properties which are unique to it (i.e. morphology, physiological properties, gene sequence, etc.), then the name may be validly published. This applies, in particular, to the description of taxa based chiefly on morphology, or where purification of all the individual components of

defined syntrophic associations has not been possible (see also Rule 18a and Rule 18f).'

The introduction of a 'protologue'

Descriptions of new taxa appear in a wide range of publications, and the requirements of the journals are diverse. This has led to various problems with locating information relating to the description of the new taxon. In some cases the name of the taxon may be included in the text, without clear reference to its properties. It is therefore, suggested that all descriptions of new names or combinations should adhere to a uniform format (c.f. the BioCode; Greuter *et al.*, 1996). This format should be adopted for the valid publication of all names (whether as original articles, or by announcement in the 'Validation Lists' and reference to a previous effective publication) appearing in the IJSB starting on 1 January 2000 (or a suitable date thereafter). This would be included as part of Rule 27(2):

'(1) The new name or new combination should be clearly stated and indicated as such (i.e. fam.nov., gen.nov., sp. nov., comb. nov., etc.).

(2) The derivation of a new name must be given.

(3) The properties of the taxon being described must be given directly after (1) and (2). This may include reference to tables or figures in the same publication, or reference to previously effectively published work.

(4) All information contained in (3) must be accessible.

(5) The type of the taxon must be designated. In the case of species or subspecies the culture collection number(s) where a subculture of the type strain has been deposited must be indicated.'

Although Rule 25a does not place restrictions on the publication of the name of a new taxon in any language, it may be appropriate to consider that the protologue (also) be published in English.

Rule 16

Changes in the Bacteriological Code indicate that Rule 16 must now specify that a type must be designated. The current Note should be replaced by the following:

'Note. If a previous effective publication does not designate a type then the type must be designated at the time of valid publication in the IJSB, in accordance with the Rules of this Code.'

Rule 18c

Rule 18c may be interpreted in an ambiguous fashion, particularly where the culture collection numbers cited in the effective publication may no longer be available, but a subculture of the type strain is otherwise available from another source. A note should be added:

'Note. The term "strain" refers to the culture or subcultures of it, described in the original description. This is not restricted to the strain bearing the culture collection number mentioned in the valid publication,

but refers to any culture knowingly derived from the original strain.'

Rule 24a

In line with changes proposed by the BioCode (Greuter *et al.*, 1996) and the International Code of Botanical Nomenclature (Anonymous, 1999), the following changes in terminology are proposed:

The terms objective and subjective should be substituted by the terms homotypic and heterotypic respectively, and junior and senior by the terms later and earlier (see also Rule 11).

Rule 24b

Priority cannot always be determined in an unambiguous fashion. At least one case has come to light where the present Rules do not govern priority. The following additions are suggested:

Rule 24b(1), add after the first sentence:

'Should the two names bear the same date, then priority shall be determined by page number. If this fails to determine priority then it shall be determined by the order of publication in the effective publication.'

Rule 24b(2) Replace the last sentence with the following:

'Should page number not determine priority, this shall be determined by the order of valid publication of the names in original articles in the IJSB. When two names, effectively published in other journals, are validly published by announcement on the same Validation List in the IJSB, priority is established by the sequence number on the list.'

Add a second note:

'Note 2. Should priority not be resolved by applying Note 1, the order of priority will be determined by page number followed by order of publication in the effective publication.'

Rule 27

At least two cases are known in which a new species has been added to a genus, for which the genus name has not been validly published. The following addition is suggested:

'Note. When a new species or a new combination results in the creation of a new genus both the genus name and the new species or new combination must be validly published. Valid publication of the new species or new combination alone does not constitute valid publication of the new genus.'

The principle of co-ordinate status

Other Codes of Nomenclature, such as the International Code of Botanical Nomenclature (Greuter *et al.*, 1994) and the BioCode (Greuter *et al.*, 1996), make

use of the principle of co-ordinate status. Using this system automatically creates a subgenus within a genus or a subspecies within a species when the genus or species name is validly published. Rule 46 effectively covers this aspect for species, but it is placed under the heading 'union of species as subspecies', which does not reflect its significance. It should be placed under the heading 'Division of a Species into Species or Subspecies, and of a Subspecies into Subspecies' (p. 36, Rule 40b). Consideration should also be given to the introduction of this system for genera and subgenera (see Rule 39a).

Rule 61

Although it is desirable to correctly spell names, the correction of names should be undertaken with caution. This applies particularly when names have been in use for long periods of time (i.e. *Acetobacter*, *Lactobacillus* or *Methylobacterium*). It is suggested that names which have been in use for longer than 10 years, without correction should not be corrected. Should, however, the species epithet of an organism be incorrectly spelt and the organism transferred to another genus, then it may be appropriate to make changes to the new combination, although the basonym has been in use for more than 10 years.

One of the current problems with the Bacteriological Code is that the revised version, published in 1992, is already out of date, following changes made during the

last International Congress of Microbiology and Applied Bacteriology. Although a printed version of the Bacteriological Code has served well in the past, it might be appropriate to provide wider access to the Bacteriological Code by making it accessible via the Internet. Considering that copyright of the Bacteriological Code rests with the International Union of Microbiological Societies, it is suggested that the Judicial Commission of the ICSB consider a proposal to permit distribution of an electronic version.

References

- Anonymous (1999).** Proposals to amend the *Tokyo Code*, submitted to the XVI International Botanical Congress, St Louis 1999, as published in *Taxon* **45–47** (1996–1998) (<http://www.bgbm.fu-berlin.de/iapt/nomenclature/PAC.htm>).
- Greuter, W., Barrie, F. R., Burdet, H. M., Chaloner, W. G., Demoulin, V., Hawksworth, D. L., Jørgensen, P. M., Nicholson, D. H., Silva, P. C., Trehane, P. & McNeill, J. (editors) (1994).** *International Code of Botanical Nomenclature (Tokyo Code)*. (*Regnum Vegetabile* series, volume 131). Königstein: Koeltz Scientific Books.
- Greuter, W., Hawksworth, D. L., McNeill, J., Mayo, M. A., Minelli, A., Sneath, P. H. A., Tindall, B. J., Trehane, P. & Tubbs, P. (1996).** Draft Biocode: the prospective international rules for the scientific names of organisms. *Taxon* **45**, 349–372.
- Lapage, S. P., Sneath, P. H. A., Lessel, E. F., Skerman, V. B. D., Seeliger, H. P. R. & Clark, W. A. (editors) (1992).** *International Code of Nomenclature of Bacteria (1990 Revision)*. *Bacteriological Code*. Washington, DC: American Society for Microbiology.