International Journal of Systematic and Evolutionary Microbiology (2001), **51**, 711–713 Printed in Great Britain

LETTER TO THE EDITOR

Rhodocista centenaria vs *Rhodospirillum centenum*: a reply to Gest and Favinger

In an accompanying letter, Gest & Favinger (2001) have documented an interesting case where two different names are applied to the same organism, namely *Rhodospirillum centenum* and *Rhodocista centenaria*. The authors also draw our attention to a number of problems which appear to be the source of confusion as to which of the two names should be used. The authors make the valid point that most microbiologists are not familiar with the Bacteriological Code (1990 Revision) (Lapage *et al*., 1992) and provide an illuminating commentary on the nature of the problems which have arisen. The purpose of the present article is to examine, in a little more depth the problems that Gest and Favinger highlight.

Having provided a brief overview of the interesting properties of the organism which they described as *Rhodospirillum centenum* (Favinger *et al*., 1989), the authors raise the point that Kawasaki *et al*. (1992) indicate in the title of their paper that they were describing *Rhodocista centenaria* sp. nov. They also draw attention to the fact that these authors were using a strain derived from ATCC 43720 (the type strain), which they deposited in the Institute of Applied Microbiology under a different number. Gest and Favinger 'considered this to be a violation of acceptable practice'. It should be noted that Kawasaki *et al*. (1992) make it quite clear in their publication that one of the organisms they were studying was in fact ATCC 43720, and that it was isolated from Thermopolis Hot Springs, Wyoming, USA, by Favinger *et al*. (1989). The fact that this strain was also deposited in the Institute for Applied Microbiology as IAM 14193 would seem, in the eyes of Gest and Favinger, to highlight some form of 'unacceptable practice'. In fact many of the major culture collections, worldwide, frequently indulge in the practice of exchanging strains (particularly type strains) to facilitate the distribution of this important biological material and also to secure the same essential biological material at different sites in order to guarantee its safe, secure and long-term availability. Far from being in violation of acceptable practice, culture collection actively co-operate in such transfers.

Gest & Favinger (2001) also bring our attention to the tricky problem of the way in which names enter into use in bacterial taxonomy and how one can determine which of two or more names is the proper one to use. The term 'effective publication' is used to denote publication of a name and a description of the taxon in conformity with the Bacteriological Code (1990 Revision) (Lapage *et al*., 1992), which excludes publication of a name in newspapers, laboratory notes or simply by labelling a culture. The most important date that is attributed to the name of a taxon is the date of valid publication, which, in this case took place via Validation List no. 48. The authors correctly indicate that both the names *Rhodospirillum centenum* and *Rhodocista centenaria* were assigned the same priority number, '2', which one may infer means that the request for valid publication of both names was received on the same day. Thus, the proper citation of the names are *Rhodocista centenaria* Kawasaki *et al*. 1994 (Kawasaki *et al*., 1994) and *Rhodospirillum centenum* Favinger *et al*. 1994 (Favinger *et al*., 1994). However, closer examination of the Bacteriological Code (1990 Revision) (Lapage *et al*., 1992) indicates that names only compete for priority within the same taxon (i.e. with a given position). Thus, had Kawasaki *et al*. (1992) named their species *Rhodospirillum gestii*, then it would be difficult to determine which of the two names has priority. However, in the present case we are dealing with differences in taxonomic opinion. If ATCC 43720 (= IAM 14193) is considered to be a member of the genus *Rhodospirillum*, then it must be called *Rhodospirillum centenum* Favinger *et al*. 1994, but should it be placed in another genus, then it must be called *Rhodocista centenaria* Kawasaki *et al*. 1994. One interesting problem arises, and that is the fact that both names are homotypic (objective) synonyms of one another, but neither is the earlier (senior) synonym. The Bacteriological Code governs nomenclature and not the way in which taxonomic disputes are settled (see Tindall, 1999). Despite the fact that Gest and Favinger consider this to be inconsistent with the aims of a fair, appropriate and useful system for nomenclature of bacteria, the Bacteriological Code makes a clear ruling on which name is to be used in which taxon. Since the choice of taxon (which genus) is a taxonomic matter the Code remains fair and impartial, allowing taxonomic battles to be fought without affecting the principles and rules of nomenclature.

In elucidating Principle 1 and Rule 55 of the Bacteriological Code (1990 Revision) (Lapage *et al*., 1992), the authors draw our attention to important aspects for avoiding the needless creation of names. In further supporting their case for not calling the genus *Rhodocista*, Gest and Favinger make a connection with the

cyst-forming ability of the organism. However, since the name *Rhodocista* is derived from the Greek (*rhodos* = red) and Latin (*cista* = basket), meaning the 'red basket', there should be no confusion, because the name does not mean the 'red cyst'. Confusion with the name '*Rhodocystis*' can easily be avoided, since *Bergey's Manual* uses it in an historical context, the name is not validly published and has no standing in nomenclature under the Bacteriological Code. While it is a pity that this name was not revived instead of creating a new genus, *Rubrivivax* for the species *Rubrivivax gelatinosa* ('*Rhodocystis gelatinosa*' Molisch, 1907), this is something that we must accept. Quite clearly the suggestion to change the name of the genus *Rhodomicrobium* to *Rhodexosporus* would be in violation of Principle 1(1).

In criticizing the title of the paper by Kawasaki *et al*. (1992), Gest and Favinger draw a number of conclusions which are not correct. Firstly there is no taxonomic committee which approved valid publication of the genus name *Rhodocista*, and secondly the authors conform to the guidelines in the Bacteriological Code. Although Favinger *et al*. (1989) described their new species in 1989, they neglected to submit the name for valid publication, and as the Bacteriological Code states, and as pointed out by Kawaski *et al*. (1992), the name *Rhodospirillum centenum* had no standing in nomenclature in 1992. Thus the authors were left with a problem of creating a species name for an organism for which no other name was recognized by the Bacteriological Code. The Code clearly advises authors to indicate new names or new combinations appropriately. Thus, Kawasaki *et al*. (1992) were at liberty to designate their genus *Rhodocista* as a new genus (gen. nov.), and in the absence of any other validly published name for the species they could only create a new species name *Rhodocista centenaria* sp. nov. It should be noted that this is a new species and not a new combination as listed on Validation List no. 48. Gest & Favinger (2001) also recognize the fact that the authors could not create a new combination, because they neglected to validly publish the name *Rhodospirillum centenum*. The concept of *nomen novum* (nom. nov.), however, is reserved for cases such as the unification of two species in the same genus, both with the same specific epithet i.e. in transferring the species *Streptoverticillium album* to the genus *Streptomyces* the fact that the type species of the genus *Streptomyces* is *Streptomyces albus* must be taken into consideration, resulting in the creation of a new name *Streptomyces luteosporeus* (basonym *Streptoverticillium album*) (Witt & Stackebrandt, 1990).

Despite interesting undertones in the article by Gest and Favinger, Kawasaki *et al*. (1992) were simply using terminology recommended by the Bacteriological Code. It should be emphasized that in operating in a fair fashion the valid publication of names is not undertaken by screening the literature, but by allowing scientists to submit suitable work as they see fit, either as articles in the *International Journal of Systematic and Evolutionary Microbiology* (IJSEM) (*International Journal of Systematic Bacteriology* before 1 January 2000), or via the Validation Lists that are published in the same journal. Neither priority nor precedence is given to any one research group: those who do not submit their own work have no-one to blame but themselves.

While it is clear that a critical evaluation of the use of 16S rDNA sequence data in the light of more recent findings based on the sequencing of total genomes should be undertaken, one should also remember that the first problems in interpretation of gene sequences are materializing. Most significant are the difficulties in assigning appropriate functions to the expressed products of genes based on the similarity of gene or protein sequences alone. Interpretation of data in the form of dendrograms is also a problem, as indicated by Gest & Favinger (2001). Despite the low confidence levels from the bootstrap values, this is not significant if one considers that Kawasaki *et al*. (1992) were dealing with three species in three genera, *Rhodocista centenaria*, *Rhodospirillum rubrum* and *Magnetospirillum gryphiswaldense*. The confidence levels are also not significant if one reduces the three species to members of one genus. Problems do, however, arise if one tries to reduce the three species to two genera which, based on 16S rDNA data alone, must meet the criteria of being monophyletic. Thus none of the pairs *Rhodocista–Rhodospirillum*, *Rhodospirillum–Magnetospirillum* or *Rhodocista–Magnetospirillum* can be recovered with confidence.

Despite the criticism of Gest & Favinger (2001), Kawasaki *et al*. (1992) used not only the 16S rDNA data, but also the data of Favinger *et al*. (1989) and additional chemotaxonomic data to support the separation of *Rhodospirillum centenum* from *Rhodospirillum rubrum*, creating the new genus *Rhodocista*. While Gest and Favinger have presented a list of objections to using the name *Rhodocista centenaria* based on 'inconsistencies' in the Bacteriological Code, closer examination of their points indicates that there is obviously a need to communicate the workings of the Bacteriological Code to a wider audience. In essence the problem boils down to a simple matter of taxonomic opinion, whether one considers *Rhodocista centenaria* Kawasaki *et al*. 1994 to be the correct name of the taxon, or whether the correct name of the taxon is *Rhodospirillum centenum* Favinger *et al*. 1994, with the associated debate whether one should define one genus or two, and that is something which the Bacteriological Code does not attempt to clarify. As Murray (1998) accurately points out, the taxonomy which lasts 'is determined by general acceptance', and long may that principle continue.

References

Favinger, J., Stadtwald, R. & Gest, H. (1989). *Rhodospirillum centenum*, sp. nov., a thermotolerant cyst-forming anoxygenic photosynthetic bacterium. *Antonie Leeuwenhoek* **55**, 291–296.

Favinger, J., Stadtwald, R. & Gest, H. (1994). *Rhodospirillum centenum* sp. nov. In *Validation of the publication of new names and new combinations previously effectively published outside the IJSB*, List no. 48. *Int J Syst Bacteriol* **44**, 182–183.

Gest, H. & Favinger, J. (2001). Taxonomic ambiguities: a case history. *Int J Syst Evol Microbiol* **51**, 707–710.

Kawasaki, H., Hoshino, Y., Kuraishi, Y. & Yamasato, K. (1992). *Rhodocista centenaria* gen. nov., sp. nov., a cyst-forming anoxygenic photosynthetic bacterium and its phylogenetic position in the Proteobacteria alpha group. *J Gen Appl Microbiol* **38**, 541–551.

Kawasaki, H., Hoshino, Y., Kuraishi, Y. & Yamasato, K. (1994). *Rhodocista centenaria* gen. nov., sp. nov. In *Validation of the publication of new names and new combinations previously effectively published outside the IJSB*, List no. 48. *Int J Syst Bacteriol* **44**, 182–183.

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.

Murray, R. G. E. (1998). Taxonomy and nomenclature. *ASM News* **64**, 669–670.

Tindall, B. J. (1999). Misunderstanding the Bacteriological Code. *Int J Syst Bacteriol* **49**, 1313–1316.

Witt, D. & Stackebrandt, E. (1990). Unification of the genera *Streptoverticillium* and *Streptomyces*, and amendation of *Streptomyces* Waksman and Henrici 1943, 339^{AL}. *Syst Appl Microbiol* **13**, 361–371.

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