What is the type species of the genus *Paenibacillus*? Request for an Opinion

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The taxonomic status of the type species of the genus *Paenibacillus* cannot be easily determined according to the rules of the Bacteriological Code since the rules may be interpreted in an ambiguous way. Depending upon how the rules are applied the type species may be either *Paenibacillus polymyxa* or *Paenibacillus durus*. In addition, depending upon the way in which the Bacteriological Code is interpreted, the question of whether the name *P. durus* (Collins *et al.* 1994) has been validly published must also be addressed.

Keywords: *Paenibacillus*, Request for an Opinion, Bacteriological Code

Ash *et al.* (1993) proposed that members of ‘group 3’ within the genus *Bacillus* should be transferred to the genus *Paenibacillus*. The type species of the genus was proposed as *Paenibacillus polymyxa*. These proposals were subsequently published in the *International Journal of Systematic Bacteriology* in the Validation Lists (see Ash *et al.*, 1994, 1995). However, Collins *et al.* (1994) also proposed that *Clostridium durum* should be transferred to the genus *Paenibacillus*, for which the orthographically correct combination is *Paenibacillus durus*. Although Collins *et al.* (1994) make clear reference to Ash *et al.* (1993) in proposing the transfer of *Clostridium durum* to the genus *Paenibacillus*, the principle of priority, based on page numbers in the same issue of the *International Journal of Systematic Bacteriology* causes confusion concerning which species is the type of the genus *Paenibacillus*. Valid publication of the name *Paenibacillus polymyxa*, the proposed type of the genus *Paenibacillus* (see Ash *et al.*, 1993) occurs in the *International Journal of Systematic Bacteriology* 44 (1994), p. 852. However, the name *Paenibacillus durus* appears in the same issue, but on p. 824. Interpretation of the Bacteriological Code is not unambiguous concerning whether the species *P. durus* or *P. polymyxa* is the type of the genus *Paenibacillus*. The following points need to be taken into consideration:

- (1) based on priority of publication the combination *P. durus* has priority over *P. polymyxa* (if both are validly published and legitimate);
- (2) Rule 20c states that ‘if the genus when originally (effectively and validly) published included one species,

then that species is the type species.’ This would apply to the combination *P. durus* in Collins *et al.* (1994);

(3) Collins *et al.* (1994) make clear reference (pp. 821 and 824) to the genus *Paenibacillus* and its formal description (effective publication) in Ash *et al.* (1993). Rule 27(1), (2) and (3) and Rule 33a do not explicitly require that a name *must* be formally proposed as ‘*Paenibacillus* gen. nov.’ Rule 28b cannot be invoked because the genus is clearly proposed and accepted by Ash *et al.* (1993) and Collins *et al.* (1994);

(4) The question which arises is whether the name *Paenibacillus* is validly published by Collins *et al.* (1994), or whether the name is validly published in the Validation Lists (Ash *et al.*, 1994).

Depending on when the name *Paenibacillus* is considered to be validly published, the type species is either *P. durus* or *P. polymyxa*. This has a number of consequences for nomenclature in this group of organisms.

- (1) If valid publication of the name is considered to have occurred in Collins *et al.* (1994), then the type of the genus is *P. durus*, and the proposal to make *P. durus* a junior subjective synonym of *Paenibacillus azotofixans* contradicts Rule 15.
- (2) If valid publication of the genus *Paenibacillus* is considered to have occurred in the Validation Lists, then the publication of the combination *P. durus* occurred at a time when the genus name *Paenibacillus* had not been validly published in or prior to the work of Collins *et al.* (1994). If this is the case for the combination *P. durus* (Collins *et al.*, 1994), then valid publication of the name cannot be considered to have

taken place and does not have standing in nomenclature. Recognition of the synonymy of *P. azotofixans* and *Clostridium durum* by Rosado *et al.* (1997) has, however, interesting consequences for the correct name of this taxon. Rule 42 governs the union of taxa of equal rank and states that the oldest legitimate name or epithet is to be retained. In this case the taxa *Clostridium durum* and *P. azotofixans* are subjective synonyms, but applying Rule 42 would make *Paenibacillus durus* the senior subjective synonym. The problem which now arises is that the combination *Paenibacillus durus* has not been validly published and it has no authors, unless it is considered to have been created by Rosado *et al.* (1997) on recognizing the synonymy of the two taxa. It should be noted that although the proposal to make *P. azotofixans* the senior subjective synonym by Rosado *et al.* (1997) is not in line with the Bacteriological Code, it does not make the name illegitimate. Similarly, if the name *Paenibacillus durus* is not considered to be validly published in Collins *et al.* (1994), the combination is not illegitimate and the name may be validly published but authorship would not be attributed to Collins *et al.* (1994). The Judicial Commission is asked to provide a ruling on the date of valid publication and authorship of the genus name *Paenibacillus* and the species name *Paenibacillus durus*.

This, and similar problems, may be avoided in the future if suitable changes are made to the Bacteriological Code which would require authors to clearly indicate that a new genus is being proposed when a name is validly published in the *International Journal of Systematic and Evolutionary Microbiology* (formerly *International Journal of Systematic Bacteriology*). Such changes must clearly state that the creation of a new species or a new combination in a new genus *must* be accompanied by the formal proposal (effective) and

valid publication of the new genus either at the time of, or prior to valid publication of new species or new combinations within that genus (see Tindall, 1999).

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