

## Letter to the Editor

### Request for a Judicial Opinion Concerning the Type Species of *Agrobacterium*

Recently, Sawada and colleagues (14) proposed the rejection of *Agrobacterium tumefaciens* (Smith and Townsend 1907) Conn 1942 and revised the descriptions of the genus *Agrobacterium* and the species *A. radiobacter* (Beijerinck and van Delden 1902) Conn 1942 and *A. rhizogenes* (Riker et al. 1930) Conn 1942. Their phylogenetic analysis of sequenced 16S rRNA confirmed that two species should be established for biovar 1 and biovar 2 agrobacteria. Their descriptions for the two species followed those for biovar 1 and biovar 2, respectively, regardless of phytopathogenic characteristics.

In the original description of the genus *Agrobacterium*, the designated type species was *A. tumefaciens* (1). The original speciation scheme, which was based on phytopathogenic characteristics, has been reiterated in the *Approved Lists of Bacterial Names* (15) and in the most recent edition of *Bergey's Manual* (10). However, several studies of phenotypic and genotypic characteristics revealed that there was no agreement between the speciation based on phytopathogenic characteristics and the real taxonomic structure of the genus (reviewed in reference 10). Consequently, several authors proposed alternative classifications and nomenclatures (2–5, 8–10, 16, 17).

Elevation of biovar 1 and biovar 2 by Sawada and colleagues (14) to the rank of species is welcomed and should end the confusion which has existed for three decades in the nomenclature of this group of microorganisms. However, in their paper, they proposed to reject *A. tumefaciens* and to replace it with *A. radiobacter* as the type species. They based their propositions on (i) the fact that the type strains of *A. radiobacter* and *A. tumefaciens* both belong to biovar 1 (10); (ii) a DNA-DNA relatedness value of more than 80% between the two type strains (3, 12, 14), placing them in the same species; and (iii) Rule 38 of the *International Code of Nomenclature of Bacteria* (11), which states that when two taxa of the same rank are united, the name of the taxon under which they are united should be chosen according to priority of publication. These points have been presented and commented upon in *Bergey's Manual* (10), but, Sawada and colleagues (14) failed to take into account key judicial elements of the *Agrobacterium* nomenclature. The first element is *Opinion 33* of the Judicial Commission (6), which in its decision to conserve the generic name *Agrobacterium* stated that *Agrobacterium tumefaciens* was the type species. The second element is the reiteration of *A. tumefaciens* as the type species in the *Approved Lists of Bacterial Names* (15). The *Approved Lists* were compiled to retain only names of adequately described taxa, for which there was a reference strain, and to set a new date for determining priorities for names of new taxa. *Opinion 58* further confirmed as correct the type species in the *Approved Lists* but without prejudice to the powers of the Judicial Commission to amend them (7).

In response to the proposal by Sawada and colleagues and for the purpose of avoiding further confusion, I request a judicial opinion to decide whether *A. radiobacter* or *A. tumefaciens* should be the type species for *Agrobacterium*. The species epithet retained would then be the species for biovar 1 strains. Not including the marine agrobacteria (13), the remaining species in the genus are *A. rhizogenes* (Riker et al. 1930) Sawada et al. 1993 for the biovar 2 strains, *A. rubi*

(Hildebrand 1940) Starr & Weiss 1943, and *A. vitis* Ophel & Kerr 1990. Until a decision is made, the type species will remain *A. tumefaciens*.

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#### Authors' Reply

The classification of *Agrobacterium* species was based on the differences in phytopathogenicity and the symptoms induced on plants. However, some investigators have questioned the validity of the use of phytopathogenic characteristics as taxonomic criteria, because they are plasmid mediated and can be transferred between strains (2). From this point of view, Ophel and Kerr (3) reconsidered the taxonomic position of biovar 3 strains isolated from grapevines and proposed to establish a new species, *Agrobacterium vitis*, for biovar 3. Afterwards, we determined the complete sequences of 16S rRNA genes for representative strains, including type strains of this genus, and performed phylogenetic analysis to resolve the remaining problems relating to the classification of this genus (4). On the basis of our phylogenetic analysis, which coincided with other phenotypic, chemotaxonomic, and genetic characteristics, we concluded that biovars 1 and 2 should have specific status. According to these two proposals (3, 4), the problems concerning the classification of this genus are fairly resolved.

However, we failed to give consideration to two important points of the *Agrobacterium* nomenclature (4). In our proposal, we assigned biovar 1 strains to *Agrobacterium radiobacter* and replaced *Agrobacterium tumefaciens* with *A. radiobacter* as the type species according to priority of publication. We failed to take into account *Opinion 33* of the Judicial Commission (1),

which conserved the generic name *Agrobacterium* with its designated type species, *A. tumefaciens*, and of the *Approved Lists of Bacterial Names* (5), which reiterates *A. tumefaciens* as the type species. Dr. Bouzar presented these points and requested a judicial opinion to decide whether *A. radiobacter* or *A. tumefaciens* should be the type species for this genus to avoid further confusion. The view presented by Dr. Bouzar is reasonable, and we agree with his request to the Judicial Commission.

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