Replacement of the Type Strain of *Streptococcus mitis* Request for an Opinion

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The type strain of *Streptococcus mitis* Andrewes and Horder 1906, 712 is strain NCTC 3165. This strain was arbitrarily designated as the type strain on the 1980 Approved Lists of Bacterial Names before adequate documentation of its characteristics. It is not an authentic strain of Andrewes and Horder; subsequent examination has indicated that it almost certainly is not representative of the species described by these authors, nor is it representative of strains widely recognized as *S. mitis*. We propose replacement of strain NCTC 3165 with strain NCTC 12261 as the type strain of *S. mitis*.

The name *Streptococcus mitis* was applied by Andrewes and Horder in 1906 (1) to streptococci that were considered saprophytes of saliva and feces. These authors separated *S. mitis* from *Streptococcus pyogenes* because *S. mitis* grew as short chains and rarely caused disease. *S. mitis* was further characterized by its ability to grow well at 20°C, by being unable to clot milk, and by fermenting sucrose and lactose. Many strains fermented salicin and coniferin, but few representatives fermented inulin. No strain studied by Andrewes and Horder is available, and it is likely that the strains studied by these authors represented more than one species according to current streptococcal taxonomy.

Based on an examination of a large collection of strains cultured from human throats, Sherman et al. (13) noted the heterogeneity of strains assigned to *S. mitis* and that the taxon lacked clearly marked characteristics, uniquely its own, which would allow rapid and positive identification by the use of only a few simple tests. However, the 147 strains assigned to *S. mitis* by these authors could be distinguished from other named species notably by their inability to ferment inulin and to produce extracellular dextran or levan and by rarely being able to hydrolyze esculin (Table 1). Subsequent descriptions of *S. mitis* in *Bergey's Manual of Determinative Bacteriology* (2) have been based on the results published by Sherman et al. (13). This definition of the species also concurs with that used by several authorities in the field (3, 7) (Table 1) and in commercial identification kits widely used in clinical microbiological laboratories.

Coleman and Williams (4) convincingly argued that the name *S. mitis* is a later synonym for "*Streptococcus mitior* seu *viridans*," which was proposed by Schottmüller in 1903 (12). Although the name "*S. mitior*" has been widely used in some parts of the world, it was not included on the 1980 Approved Lists of Bacterial Names (14) and has no formal standing in nomenclature.

In contrast to "*S. mitior*," *S. mitis* was included on the 1980 Approved Lists (14), with reference to the description given in *Bergey's Manual*, 8th ed. (2), which was based on the publication by Sherman et al. (13). "*Streptococcus* sp. *viridans* type" strain NCTC 3165 (= ATCC 33399), which was isolated from pyorrhoea in 1930, was arbitrarily designated the type strain before adequate documentation of its characteristics. Subsequent examination has disclosed that this strain differs from the descriptions of the species given

by both Andrewes and Horder (1) and Sherman et al. (13), notably in its ability to ferment inulin and to hydrolyze both arginine and esculin (10, 16) (Table 1). Furthermore, deoxyribonucleic acid (DNA)-DNA hybridization tests revealed that strain NCTC 3165 is only moderately related (41%) to strains fitting the description of *S. mitis* (16). The results of our taxonomic study, which are described in the accompanying paper (9), as well as the results of our recent genetic study (8), reveal that strain NCTC 3165 is an atypical member of a taxon that is proposed as a new species, which is characterized by inulin fermentation, arginine and esculin hydrolysis, production of extracellular dextran from sucrose, β -glucosaminidase and α -L-fucosidase activities, and lack of immunoglobulin A1 protease activity (9). The relationship of strain NCTC 3165 to other members of this new species has been confirmed by DNA-DNA hybridization experiments (16).

Because strain NCTC 3165 almost certainly is not representative of *S. mitis* as originally described, was not properly documented before its assignment to the status of type strain, and is not representative of the species as defined by clinical microbiological laboratories, we believe that it is not a valid type strain. Conservation of strain NCTC 3165 as the type strain will mean that it becomes a phenotypically (9) and genetically (8) atypical representative of a species which is characterized by dextran production, by arginine and esculin hydrolysis, and by the ability to ferment inulin. As these phenotypic traits have traditionally excluded a diagnosis of *S. mitis*, the situation would, in our opinion, create confusion. We propose strain NCTC 12261 as the valid type strain of *S. mitis* in agreement with the results described in the accompanying paper (9).

We request that the Judicial Commission rule that strain NCTC 3165 is not the valid type strain of *S. mitis* according to Rule 18g (15) (formerly Rule 18i [11]), which states that if a type strain has become unsuitable due to changes in its characteristics or for other reasons, the matter should be referred to the Judicial Commission, which may take action leading to replacement of the strain. We further request that the Judicial Commission designate strain NCTC 12261 as the type strain of *S. mitis*. Pending the decision of the Judicial Commission, we have offered an emended description of *S. mitis* in the accompanying paper (9).

After the submission of this request, Coykendall published a request to reject strain NCTC 3165 as the type strain of *S. mitis* (5). He proposes that *S. oralis* be considered a later

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TABLE 1. Phenotypic characteristics of *S. mitis* as defined by selected authors, of the present type strain (strain NCTC 3165), and of the strain (strain NCTC 12261) by which it is proposed to be replaced

Characteristic	% of strains positive in the study of:				Reaction of:	
	Sherman et al. ^a	Facklam ^b	Kilian et al. ^c		Strain NCTC 3165 ^c	Strain NCTC 12261 ^c
			Biovar 1	Biovar 2		
Arginine hydrolysis	43	16	0	100	+	—
Esculin hydrolysis	21	0	0	0	+	—
Dextran produced from sucrose	0	10	0	0	—	—
Fermentation of:						
Inulin	0	0	0	0	+	—
Raffinose	32	0	70	100	—	+
Salicin	74	28	20	39	+	—
Threhalose	15	25	30	8	+	—
Lactose	100	100	100	100	+	+

^a Reference 13. The description of *S. mitis* in this reference is referred to in the Approved Lists of Bacterial Names (14).

^b Reference 7.

^c Reference 9.

synonym of *S. mitis* and that the present type strain of *S. oralis* (strain NCTC 11427) be adopted as the type strain of *S. mitis*. However, this proposal is in conflict with the DNA-DNA homology data reported by Coykendall and Munzenmaier (6), which show that *S. oralis* and *S. mitis* as defined by us on the basis of phenotypic and antigenic differences (9) share less than 40% DNA sequence homology.

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