



IDF position paper on clarifying taxonomy of dairy starter culture *Streptococcus thermophilus*

Streptococcus thermophilus is widely used as a starter culture in cheese, yogurt, and other dairy products and has significant research and application value in the food industry. The taxonomy of *Streptococcus thermophilus* has been adjusted and changed several times throughout history, increasing the difficulty of regulating this species in fermented foods. Currently, both taxonomic names, *Streptococcus thermophilus* and *Streptococcus salivarius* subsp. *thermophilus*, are used in scientific research, regulatory management, and related industries. The existence of two taxonomic names creates confusion for dairy companies, suppliers, and regulators.

To review the taxonomy change history, *Streptococcus thermophilus* (Orla-Jensen, 1919) and *Streptococcus salivarius* (Andrewes & Horder, 1906) were all approved in the International Journal of Systematic and Evolutionary Microbiology (IJSEM) Approved Lists in 1980 (Skerman et al., 1980). In 1984, *Streptococcus thermophilus* was reclassified as *Streptococcus salivarius* subsp. *thermophilus* (Farrow & Collins, 1984), and it was also approved in IJSEM Validation List No. 15 in 1984. In 1991, Schleifer et al. (1991) proposed revising the taxonomy of this species back to *Streptococcus thermophilus*, (basonym: *Streptococcus salivarius* subsp. *thermophilus*), which was on IJSEM Validation List No. 54 in 1995. Also, the List of Prokaryotic names with Standing in Nomenclature (LPSN) has recently updated their category "Correct name" to *Streptococcus thermophilus* and given synonym status to *Streptococcus salivarius* subsp. *thermophilus*.

With that change, *Streptococcus salivarius* subsp. *Thermophilus* is now its own species, different from *Streptococcus salivarius*, and synonym to *Streptococcus thermophilus*.

Taxonomy and systematics constitute the basis for the regulatory frameworks for Microbial Food Cultures (MFCs). In the International Dairy Federation (IDF) Inventory of MCFs, the taxonomy of *Streptococcus salivarius* subsp. *thermophilus* was used in the Bulletin of the IDF N° 455/2012 (IDF, 2012), IDF N° 495/2018 (IDF, 2018), IDF N° 514/2022 (IDF, 2022). Recently, the genetic relatedness between *Streptococcus thermophilus* and *Streptococcus salivarius* based on 16S rRNA gene, *recA* housekeeping gene, core genes phylogeny, average nucleotide identity (ANI), and digital DNA-DNA hybridization (dDDH) were analyzed by IDF subject matters experts, and the analysis results support the recognition that *Streptococcus thermophilus* and *Streptococcus salivarius* are two different species. The data will be published in a peer-reviewed paper.

Considering the current analysis results and the public databases such as LPSN have updated the name, the next update of the 5th IDF Inventory will include that *Streptococcus thermophilus* is the correct name, and the synonym is *Streptococcus salivarius* subsp. *thermophilus*.



References

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