Lactic acid bacteria – Genetics, metabolism and application

This issue of FEMS Microbiology Reviews covers the 8th International Symposium on Lactic Acid Bacteria (LAB8), held August 28th–September 1st, 2005, in Egmond aan Zee, The Netherlands. This meeting marks a renaissance in LAB research that is reflected in the series of reviews presented here.

Lactic acid bacteria (LAB) are low G + C gram-positives that are used in a variety of industrial food and feed fermentations. Research on the genetics, metabolism and application of these bacteria has made considerable progress over the last decades, as is evidenced by the seven FEMS-sponsored LAB symposia that have been organized since 1983. This LAB8 Symposium therefore concludes a period of more than 21 years during which LAB research has matured considerably, the main developments of which are reviewed in this issue.

An important area that has advanced rapidly is the characterization of the genomes of LAB and their genetic elements. Today, more than a dozen LAB genomes have been completed and this provides the basis for further understanding and industrial innovation. This area is covered by the first four papers, which address the functional and comparative genomics of LAB. The opening review by Todd R. Klaenhammer and colleagues highlights the genomic features impacting bioprocessing and health. It also reviews the main achievements in LAB research over recent years. The next paper, by Jan Kok and coworkers, deals with the functional genomics of Lactococcus lactis, a model genetic system and a globally important cheese starter. Subsequently, Pascal Hols and colleagues review current knowledge on the comparative genomics of Lactococcus lactis, a model genetic system and a globally important cheese starter. Subsequently, Pascal Hols and colleagues review current knowledge on the comparative genomics of Streptococcus thermophilus, which is mainly used in yoghurt production. Finally, David Mills and coworkers provide an overview of the use of Oenococcus oenos in the production of wine, and illustrate how genomic approaches may help in improving specific processes such as malolactic fermentation.

The LAB renaissance has also been stimulated by the increasing attention directed towards the production of functional foods, in which LAB and related bacteria feature strongly. This area is covered in the next series of three papers that address not only the traditional LAB, but also focus on the related gram-positive, high G + C Bifidobacteria. Firstly, Elaine Vaughan and coworkers provide an overview of the diversity and activity of LAB and bifidobacteria in the human intestine, while also introducing recent advances in intestinal microbiology. Subsequently, Adrienne Klijn, Annick Mercenier and Fabrizio Arigoni describe the lessons learned from comparative and functional genomics approaches to bifidobacteria from the human intestine. Finally, Ávald-Jääskeläinen and Airi Palva describe the molecular properties of surface layers of LAB and how they can be used to expose and deliver specific therapeutic molecules to the animal intestinal tract.

The discovery and exploitation of functional properties of LAB that contribute to their use in foods is an intensifying area of research that is covered in the last series of papers. The contribution of Helena Santos and colleagues reviews sugar metabolism and its control in LAB, specifically by exploiting the power of metabolic NMR approaches. The subsequent review by Karin Hammer and coworkers deals with nucleotide metabolism and its genetic control in L. lactis and other LAB. In addition, Gerrit Smit and colleagues review the flavor pathways in LAB and the biochemical profiling of flavor formation. Finally, Eric Johansen and coworkers provide an overview of the long and winding, though exciting road from the research laboratory to the industrial application of LAB.

All of these contributions have been written by experts in their field and together they provide an excellent overview of the state of the art of research on LAB, their use in the food industry and their potential in promoting human and animal health and nutrition. It is expected that this issue will impact upon the scientific progress on LAB as paradigms, and drive the innovation cycle that is required for advancing industrial applications. We are pleased to have been involved in editing this important and timely collection of reviews.

Guest Editors
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