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Integrated -omic approaches to understand the adaptations of *Lactococcus lactis* to zero-growth conditions

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Extremely low availability of nutrients, especially carbon sources, is a significant challenge for bacteria, not only in natural environments, but also in industrial fermentation processes. An example is the process of cheese ripening, in which lactic acid bacteria in the cheese matrix are depleted from fermentable substrates. Survival under these conditions requires adaptations of cellular metabolism, and coincides with extremely slow or zero-growth of the microorganisms. Zero-growth is defined as metabolically active, non-growing state of a microorganism in which product-formation capability is maintained and thereby is principally different from starvation.

Retentostat cultivation system has been designed to simulate zero-growth conditions. Retentostat cultivation is a modification of chemostat cultivation in which the complete biomass is maintained in the fermenter by removing the spent-medium effluent through a retention filter-unit, while the medium is supplied at a fixed dilution rate. Prolonged retentostat cultivation leads to growth rates that approximate zero while the rate of energy transduction equals the maintenance energy requirement.

The aim of this study is to examine the physiological and molecular behavior of *Lactococcus lactis* during the transition from a growing to a zero-growth state using glucose-limited retentostat cultivation. After cultivating *L. lactis* at extremely low-growth rates in retentostat conditions, cell physiology, metabolic profile, and viability of the culture were investigated. Besides, the genome-wide transcriptome and targeted metabolome patterns were determined to understand the molecular adaptations of the strain under zero-growth conditions. Finally, the transcriptome data allowed identification of transcription signatures that reflect the zero-growth conditions within the extended retentostat cultivation.

Biography

Onur Ercan graduated from the Department of Molecular Biology and Genetics in Istanbul Technical University, Turkey, in 2005 and received his MSc degree in Biotechnology in 2008. He has done his Ph.D. at Laboratory of Microbiology in Wageningen University, the Netherlands. His Ph.D. project was done with the collaboration of Kluyver Centre, TI Food and Nutrition, and NIZO Food Researchers in the Netherlands. He is currently the guest researcher in Wageningen University.

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