Lactobacilli and pediococci as versatile cell factories - Evaluation of strain properties and genetic tools - DTU Orbit (18/01/2019)

This review discusses opportunities and bottlenecks for cell factory development of Lactic Acid Bacteria (LAB), with an emphasis on lactobacilli and pediococci, their metabolism and genetic tools. In order to enable economically feasible bio-based production of chemicals and fuels in a biorefinery, the choice of product, substrate and production organism is important. Currently, the most frequently used production hosts include Escherichia coli and Saccharomyces cerevisiae, but promising examples are available of alternative hosts such as LAB. Particularly lactobacilli and pediococci can offer benefits such as thermostolerance, an extended substrate range and increased tolerance to stresses such as low pH or high alcohol concentrations. This review will evaluate the properties and metabolism of these organisms, and provide an overview of their current biotechnological applications and metabolic engineering. We substantiate the review by including experimental results from screening various lactobacilli and pediococci for transformability, growth temperature range and ability to grow under biotechnologically relevant stress conditions. Since availability of efficient genetic engineering tools is a crucial prerequisite for industrial strain development, genetic tool development is extensively discussed. A range of genetic tools exist for Lactococcus lactis, but for other species of LAB like lactobacilli and pediococci such tools are less well developed. Whereas lactobacilli and pediococci have a long history of use in food and beverage fermentation, their use as platform organisms for production purposes is rather new. By harnessing their properties such as thermostolerance and stress resistance, and by using emerging high-throughput genetic tools, these organisms are very promising as versatile cell factories for biorefinery applications.

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