Genome editing of lactic acid bacteria: opportunities for food, feed, pharma and biotech

This mini-review provides a perspective of traditional, emerging, and future applications of lactic acid bacteria (LAB) and how genome editing tools can be used to overcome current challenges in all these applications. It also describes available tools and how these can be further developed, and takes current legislation into account. Genome editing tools are necessary for the construction of strains for new applications and products, but can also play a crucial role in traditional ones, such as food and probiotics, as a research tool for understanding mechanistic insights and discovering new properties. Traditionally, recombinant DNA techniques for LAB have strongly focused on being food-grade, but they lack speed and the number of genetically tractable strains is still rather limited. Further tool development will enable rapid construction of multiple mutants or mutant libraries on a genomic level in a wide variety of LAB strains. We also propose an iterative Design-Build-Test-Learn workflow cycle for LAB cell factory development based on systems biology, with "cell factory" expanding beyond its traditional meaning of production strains and making use of genome editing tools to advance LAB understanding, applications and strain development.

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