The past few decades have demonstrated unequivocally the importance of the human microbiota to both short-term and long-term human health. Microbiota can be modulated by microbes with demonstrated effects and by their products. Probiotic strains, defined as “live microorganisms that, when administered in adequate amounts, confer a health benefit on the host”, have been marketed probiotics from a limited list of genera, which mainly include Lactobacillus spp., Bifidobacterium spp. and more recently Bacillus spp. With the development of better culturing and stabilization methodologies, more powerful and affordable sequencing methods and tools to investigate functions and mechanisms, the range of organisms with potential health and development potential has dramatically expanded. Several next-generation probiotics (NGPs), or live biotherapeutic products (LBPs), are in in various phases of development as drugs and medical devices, as well as supplements that address specific consumer needs and issues. In the last decade, microbial consortia and fecal microbiota transplants (FMT) have sparked interest in microbiome drug development for the management of different conditions contributed by disturbance of the bowel microbiota. More recently the potential influence of non-viable bacterial cells and their components on probiotic functionality has receive increasing attention in the development of postbiotics, defined as a “preparation of inanimate microorganisms and/or their components that confers a health benefit on the host” (Salminen et al., 2021). In contrast to probiotics, postbiotics are deliberately inactivated microbial cells with or without metabolites or cell components that contribute to demonstrated health benefits.

The development of both LBPs and postbiotics with scientifically validated health properties and demonstrated safety has important technological challenges that are often one the most limiting aspects for commercial translation. Probiotics, being of intestinal origin, are mainly anaerobic microbes, extremely sensitive to oxygen in live form and to many environmental stresses encountered during the steps of the production and storage and the digestion until there are delivered to the gut. The viability and activity are key parameter for developing products of qualified specifications.

The aim of this special issue is to highlight innovative and emerging knowledge and technologies for screening, culturing and downstream processing of LBPs and postbiotics. We welcome original or review manuscripts, perspectives, opinions, and commentary on different aspects and latest developments to this special issue, including but not limited to:

- High throughput screening methods for investigating growth and functions of LBPs and optimizing conditions thereof;
- Traditional and innovative fermentation technologies: batch, fed-batch, continuous, high cell density, anchored cultures with biofilms, immobilization, cell physiology profiling;
- Downstream processing technologies, including cell harvesting, formulation, stabilization methods (deep-freezing, drying, packaging, encapsulation, …) and conditions for enhancing the stability of the microbial product;
- Inactivation procedures or techniques of postbiotics with effects on the final postbiotic composition;
- Quality measurement and specifications along the processing steps;
- All aspects pertaining to processing factors important in their creation, proper characterization, safety and current regulatory frameworks.

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