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Metabiotics: an overview of progress, opportunities and challenges

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Symbiotic microbiota is involved in the development and implementation of energetic, metabolic, immune and neurohormonal homeostasis of human being. This multi-faceted participation is ensured by the microbial low molecular weight compounds (*mLMWC*), many of which are similar to bioactive molecules of human cells or present in food products. Various factors and agents are able to induce disorders in human microbiota, increasing the risk of metabolic diseases and malignancies. To restore micro-ecological imbalance, several generations of probiotic microbe-containing medicines and food products have been worked out. Unfortunately, their effects are often short term or absent or uncertain. Traditional probiotics prepared on the base of living microorganisms may cause opportunistic infections, autoimmune and allergic disorders, induce micro-ecological imbalance, modify gene expression, promote gene transfer, damage the integrity of the host genome and epigenome, activate signaling pathways associated with chronic diseases. To improve commercially available probiotics in principle the new biologically active products (Metabiotics-*M*) have been suggested. *M* are structural components of cells, metabolites and signaling molecules of already known probiotic strains of microorganisms, with determined chemical structure that can optimize host specific physiological functions, regulator, metabolic and/or behavior reactions connected with activity of host symbiotic microbiota. *M* on the base of *mLMWC* can be used as remedies, bio-active food additives or as enriching microbial ingredients to functional foods for rebuilding microbiota and restoring health, especially for some individuals. They have some advantages because of proven specific benefit effect(s), well dosed, safety and long shelf-life. The broad introduction of *M* can become a stimulus for the development of the medical and/or food biotechnology and will permit to include hundreds of known and novel strains of symbiotic microorganisms permanently inhabiting different human biotopes in the biotechnological processes. In the nearest future, by analogy with antibiotics, it could expect the emergence of synthetic (or semisynthetic) *M* that will be analogies or improved copies of natural bio-actives produced by symbiotic microorganisms.

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