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Engineering the microbiome through biotechnology and nutrition

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Lactobacillus reuteri DSM17938 is the first genetically modified probiotic strain that is used in large-scale production for infant nutrition. Now that this formula is several years in the global market, it may have proven value that the product can be considered safe for consumption. The use of this strain is a landmark for genetically manipulation of probiotics in order to change functional properties of a probiotic species to change its efficacy, quality or safety. The Food and Agriculture Organization of the United Nations and the World Health Organization provide guidelines for probiotics: (1) Proper identification to the level of strain of all probiotics in the product, with deposit of all strains in an international culture collection. (2) Characterization of each strain for traits important to its safety and function. (3) Validation of health benefits in human studies, including identification of the quantity of the microorganism required to provide the benefit. (4) Truthful and not misleading labeling of efficacy claims and content through the end of shelf life. Consumed probiotics encounter the microbiome, which is (majorly) the microbiological ecosystem in the gastro-intestinal tract that lives in close harmony with its host. The microbiome of any living organism catalyzes biochemical reactions influencing the bioavailability and metabolism of bioactive molecules like nutraceuticals, pharmaceuticals, feed and/or food (additives). Consumption of food, (bioactive) components or genetically modified probiotics changes the microbiome, so that the growth of certain microbial species will be (dis) favored. New developments in microbial biotechnology, food technology and nutrition enable a targeted approach to prevent or treat medical conditions through engineering the microbiome. As we learn from approaches that have been applied, careful evaluation should be made when genetically modified micro-organisms are used in food or nutrition products for general or specific purpose in human and animal nutrition

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