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SS - 4**Prebiotics, Gut Microbiota and Human Health**

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Prebiotic and probiotic ingredients are both intended to provide a health benefit to consumers by selectively improving the intestinal microbiota. While the probiotic approach endeavours to orally deliver live beneficial bacteria to the gut, the prebiotic strategy aims to selectively stimulate desirable bacterial populations *already resident* in the intestinal tract. Prebiotics offer a number of practical and theoretical advantages over probiotics. These include processing and storage stability, overcoming issues of host-microbiota compatibility and providing benefits stemming from increased carbohydrate fermentation in the gut.

A large volume of evidence from human and animal studies has demonstrated that prebiotics can modify the dynamics of the colonic microbiota, and in particular stimulate the proliferation of bifidobacteria and reduce the numbers of putrefactive bacteria. To date, the most consistent evidence for prebiotic effects has been for fructo-oligosaccharides and the polyfructan inulin. Good evidence also exists for the prebiotic activities of galacto-oligosaccharides and lactulose, while a number of other non-digestible oligosaccharides and dietary fibres have indications of prebiotic action.

As our knowledge of the gut microbiota improves, prebiotic intervention strategies that may lead to tangible health benefits are emerging. The composition of the gut microbiota changes naturally with age, and differences have been observed between healthy and diseased individuals. Therefore, prebiotic strategies need to be targeted to reflect the desired outcome for specific demographics. Prebiotics are now used effectively to emulate the bifidogenic effect of human milk oligosaccharides in dairy-based infant formulas. There is good evidence that prebiotics can relieve constipation and control hepatic encephalopathy, and emerging evidence for benefits in increasing calcium uptake, boosting colonisation resistance against intestinal pathogens, and ameliorating inflammatory bowel disease. Other health benefits for which prebiotics have preliminary support from human or animal studies are reductions in risk factors for colon cancer, immunomodulation, and control of serum lipids.

It is clear that we are only at the very beginning of understanding the role of specific intestinal bacterial populations in health and disease and their interactions with each other, the host and the diet. Addressing these fundamental questions is an important prerequisite to developing targeted disease intervention strategies involving modification of the intestinal microbiota. While promising evidence that prebiotics can provide health benefits is emerging, the challenge remains to demonstrate significant benefits to human health in large, randomized and controlled, human clinical trials.