



NutraFlora® Enhances Digestive and Immune Health

Normal intestinal function and colonic integrity are critical to maintaining digestive and immune health. Problems with intestinal function, such as chronic constipation and irritable bowel syndrome (IBS) are major concerns for many populations across all stages of life. Fiber is essential to digestive health. Most adults eat less than the 25-35 g per day of fiber recommended by the World Health Organization (1).

The colon is home to more than three pounds of bacteria that are intimately associated with their host tissues, and are known to exert their influence on the structure and function of these tissues (2). The colonic microflora have considerable impact on the host immune system.

NutraFlora® short-chain fructooligosaccharides (scFOS®) is a soluble fiber (3) that is not digested by salivary or digestive enzymes (6). Beneficial strains of bacteria have been shown to ferment NutraFlora, particularly *Bifidobacteria* and *Lactobacilli* species (5-8), which are known to produce short chain fatty acids (SCFA) (9). SCFA promote protective effects on the gut and host, such as increased gut integrity (10-16), enhanced immunity through pathogen inhibition (5, 17), reduction of putrefactive substances (18), improved normal bowel function (19-23), and improved nutrient metabolism and absorption (15). Significant increases in *Bifidobacteria* and additional health benefits can be seen with as little as 1 gram scFOS per day (5, 21, 24, 25).

Since neither the major putrefactive nor pathogenic bacteria in the gut ferment NutraFlora, it fosters an environment that favors competitive inhibition of pathogens. When *Bifidobacteria* species increase, pathogens, such as *Clostridium perfringens* tend to decrease in number (5, 26-28). Moreover, human strains of pathogenic species of *Salmonella*, *Listeria*, *Escherichia* and *Campylobacter*, exhibit minimal to no ability to ferment NutraFlora in vitro (5, 16, 18, 29-32). In addition to substrate studies, the bifidogenic properties of NutraFlora have been documented across several species in vivo, including humans (8, 33-41).

The production of SCFA, particularly lactic acid, from scFOS suppresses inflammation and can assist in the control of inflammatory bowel conditions (42). The anti-inflammatory effects of NutraFlora have been demonstrated in animals with experimentally induced colitis (17, 43). NutraFlora has performed comparably to fish oil, xylooligosaccharides (35, 40), and the anti-inflammatory drug, sulfasalazine (40). Normalization of C-reactive protein, a marker of inflammation, took significantly fewer days (7 vs. 10) in patients with severe acute pancreatitis receiving enteral nutrition formula containing NutraFlora compared with control formula. The length of hospital stay (10 vs. 15 days) and time requiring enteral feedings (8 vs. 10 days) were also significantly reduced with the enteral formula containing NutraFlora (44).

Additionally, as an ingredient in an enteral formula, NutraFlora has been shown to contribute to SCFA production, which may increase cecal absorption and blood flow

helping to maintain gut integrity (45, 46). During acute secretory diarrhea, an oral electrolyte solution with NutraFlora accelerated recovery of beneficial bacteria while slowing pathogenic bacteria (47). A particularly important benefit of NutraFlora consumption is the proliferation of gut-associated lymphoid tissue (GALT), which confers a protective effect through immune system modulation (48-51). The intestinal mucosa can be considered the largest immune-system organ in the body, with about 60% of the total immunoglobulin secretion occurring in the gastrointestinal tract. The GALT is constantly interacting with the colonic microflora, making this organ extremely dynamic, in terms of immune function. Furthermore, GALT activity is also thought to be associated with a decrease in the incidence of certain types of cancer (52). The use of NutraFlora also diverts some nitrogenous waste from the blood to the colon, thereby sparing kidney function (53).

Allergy is another inflammatory condition that appears to be modulated by intestinal microflora. Nonallergic children have been reported to have greater numbers of bifidobacteria than allergic children (54, 55). Animals supplemented with scFOS during late pregnancy and lactation exhibited higher colostrum and milk immunoglobulin M (IgM) content. In addition, there was a positive trend toward higher *Bordetella bronchiseptica*-specific IgM immune response when puppies were intranasally immunized (56). Neither acute nor long-term ingestion of NutraFlora has been associated with any adverse effects (57-61). NutraFlora provides improved intestinal function, bifidogenesis and other immune health benefits. Studies have demonstrated that bifidogenesis can be obtained with 1.1 grams of NutraFlora per day.

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