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**FILE: ■Probiotics
■Microflora
■Gastrointestinal Tract**

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RE: Probiotics – A Review

Drisko JA, Giles CK, Bischoff BJ. Probiotics in health maintenance and disease prevention. *Alternative Medicine Review* 2003;8:143–155.

Beneficial microflora were identified in the gastrointestinal tracts of healthy persons by microbiologists in the late 19th century; these microflora were termed *probiotics*, literally meaning "for life." Probiotics are microorganisms that "exert health-promoting influences in humans and animals" and in 1994 were deemed by the World Health Organization to be the "next-most important immune defense system when commonly prescribed antibiotics are rendered useless by antibiotic resistance." "Microbial interference therapy" is the term given to the use of probiotics in cases of antibiotic resistance. This article reviews some of the health maintenance and disease prevention aspects of probiotics.

The gastrointestinal tract of human infants is sterile until vaginal and fecal microflora are ingested at delivery, and the subsequent introduction of food to infants enhances the microfloral population. Probiotics maintain a delicate balance between the gastrointestinal tract and the immune system. Disease and inflammation result if this balance is disrupted. In other words, a healthy gastrointestinal system prevents the overgrowth of pathogenic bacteria. Probiotic microflora prevent the colonization of pathogenic bacteria in the gut by competing for nutrients and producing antitoxins and help the gut to function normally. Byproducts of microflora contribute to the health of the gastrointestinal tract; these byproducts include short-chain fatty acids, polyamines, vitamins, antioxidants, and amino acids. The probiotics *Lactobacillus plantarum*, *L. rhamnosus*, *L. reuteri*, and *L. agillis* exhibit favorable characteristics (e.g., prevent food decay, remove toxic food components, and preserve antioxidants and vitamins) in the human gut; however, these species are rare in persons living in industrialized countries because the Western-type diet (which is often deficient in fermented food) commonly consumed by this population lacks Lactobacilli.

Supplementation with probiotics has both direct and indirect effects. Probiotics exert direct effects locally in the gastrointestinal tract (e.g., up-regulation of immunoglobulins such as immunoglobulin A, down-regulation of inflammatory cytokines, and enhancement of gut barrier function) and indirectly at sites outside the gastrointestinal tract, including the joints, lungs, and skin. These indirect effects most likely result from an effect on immunity through changes in inflammatory mediators such as cytokines. Probiotics have proven beneficial in the treatment of disorders such as rheumatoid arthritis, allergies, eczema, hyperlipidemia, liver disease, maldigestion, diarrhea, *Helicobacter pylori* infections, vaginitis, neonatal enterocolitis, colon cancer, irritable bowel syndrome, and inflammatory bowel disease.

Lactobacillus GG was shown to reinforce mucosal barrier mechanisms in patients with inflammation associated with rheumatoid arthritis, to decrease the occurrence of eczema in infants, and to suppress bacterial enzyme activity. These bacterial enzymes are thought to play a role in the activation of carcinogens in the large intestine. *L. plantarum* 299v supplementation was shown to augment the immune response in children congenitally exposed to the human immunodeficiency virus and to reduce abdominal pain, bloating, flatulence, and constipation in patients with irritable bowel syndrome. In humans, *L. acidophilus* NCFM and *L. sporogenes* were found to "take up cholesterol" in the presence of bile and in the absence of oxygen. *L. sporogenes* was also shown to provide relief from symptoms of vaginitis in women, regardless of whether the infection was of fungal or bacterial origin. In a 76-year-old man with liver cirrhosis, a one-month treatment with the probiotic preparation VSL #3 (a combination of *Streptococcus thermophilus*, *Bifidobacteria*, *L. acidophilus*, *L. plantarum*, *L. casei*, *L. debrueckii bulgaricus*, and *S. faecum*) increased blood velocity and flow in the portal vein.

Probiotics are commonly used to treat diarrheal diseases, particularly *Lactobacillus* GG, *L. reuteri*, *Saccharomyces boulardii*, and bifidobacterial species. Evidence for the use of probiotics to treat *H. pylori* infections is conflicting. Alba et al. and others have demonstrated that *L. salivarius* produces high amounts of lactic acid, which was shown in vivo and in vitro to inhibit the growth of *H. pylori*. However, *L. acidophilus* was ineffective in suppressing *H. pylori* in vivo and in a human clinical trial. *Bifidobacterium infantis* supplementation was shown to effectively reduce the risk of neonatal enterocolitis. *S. boulardii* was shown to extend the duration of remission and to reduce the rate of relapse in patients with Crohn's disease.

In conclusion, "current evidence" supports the idea that oral probiotic therapies may be beneficial in several disorders "both inside and outside the gastrointestinal tract." "Exciting new evidence" supports the use of probiotics for a "widely divergent set of disorders" such as atopic disease, vaginal infections, and immune compromise.

—Brenda Milot, ELS

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