

ADVANCES IN NUTRITION

Current Developments in Nutrition Support, Dietary Issues, and Weight Management

Probiotics and Prebiotics



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G&H What are probiotics and prebiotics?

MF Probiotics are live microorganisms that, when administered in adequate amounts, confer a health benefit to the host. There are different groups of probiotic microorganisms. As for prebiotics, the original definition was presented by Gibson and Roberfroid in the *Journal of Nutrition* in 1995 as a nondigestible dietary ingredient that beneficially affects the host by selectively stimulating the growth or activity of a limited number of bacteria in the colon. That definition has been modified by many people, but it is a simple one. Fructooligosaccharides are a primary example of prebiotics, whereas nonstarch polysaccharides, plant wall polysaccharides, and pectins, among other carbohydrates, are not necessarily prebiotic agents, but most are classified as dietary fiber. Thus, all fiber is not prebiotic, and all prebiotics are not fiber, but what fiber and prebiotics have in common is that neither is digestible by human enzymes. Rather, they are fermented and digested by the microbiota of the intestine.

G&H What are your thoughts on the new avid interest in the gut microbiome?

MF In the 1970s and 1980s, Yale laboratories and those of the many anaerobic intestinal bacteriologists expressed interest in the microecology of the intestinal tract. These researchers demonstrated that there was a functional metabolism in the relationship between the intestinal bacteria and liquids that entered the tract. In the past few years, the National Institutes of Health realized how important the microbiota are and that they actually outnumber the

number of cells in the human body. The Human Microbiome Project was developed. This project is a repository for data about human and animal gut microecology. Dr Adam S. Kim, a gastroenterologist in private practice in Saint Paul, Minnesota, and I fully discussed this topic in a book called *Probiotics: A Clinical Guide*.

Gut microecology consists of the microbiota and the nutrients that feed these organisms, which include dietary fiber, probiotics, and prebiotics. The microecology is very dynamic and always active. We can change the microbiota by feeding them different amounts of prebiotics or dietary fiber. For example, if a person ingests large amounts of the prebiotic inulin, a fructan polysaccharide, he or she stimulates the growth of some bifidobacteria, which are essential to intestinal health and have an effect on bowel movements, particularly constipation. Thus, by consuming certain foods (prebiotics), the growth of beneficial bacteria that affects the function of the gut can be stimulated.

G&H Is yogurt an adequate probiotic?

MF Bifidobacteria are found in some yogurts, but we actually have very few anecdotal studies on the role of yogurt as a dietary probiotic. If we go back in history, we will find that the Indians and Chinese consumed yogurt cultures, which they claimed had health benefits. However, studies have not been adequately performed on the value of yogurt in Western society.

Although yogurt is considered to be a probiotic by some, it is actually a food that contains probiotics. The amount and type of organisms or strains of organisms in

commercial yogurts vary. Some companies have put efforts into developing highly active probiotic yogurt products, but because the US Food and Drug Administration considers these probiotic foods to be “generally regarded as safe” (GRAS), there are limited resources put toward research about their true health or therapeutic benefits or how the products can be optimized as probiotics. Dannon has developed several products such as Activia and Danimals. Activia contains numerous probiotic organisms, and Danimals has *Lactobacillus* GG. There are numerous probiotic products currently on the market being sold over-the-counter in health food stores.

Dr Fergus Shanahan, professor and chair of the Department of Medicine at the University College Cork of the National University of Ireland, conducted 2 large studies with the organism *Bifidobacteria infantis*. Using a very specific strain of this organism, he demonstrated that it helped control the symptoms of irritable bowel syndrome (IBS).

G&H Do VSL#3 and *Escherichia coli* Nissle 1917 have therapeutic value in conditions such as ulcerative colitis?

MF The product VSL#3 consists of 8 organisms: *Bifidobacteria breve*, *Bifidobacteria longum*, *B infantis*, *Lactobacillus acidophilus*, *Lactobacillus plantarum*, *Lactobacillus paracasei*, *Lactobacillus bulgaricus*, and *Streptococcus thermophilus*. Several papers in the literature show that VSL#3 is effective, particularly in children, in decreasing the symptoms of ulcerative colitis and facilitating remission. In older literature, organisms such as *Escherichia coli* Nissle 1917 were studied and also found to be effective, but the studies were not as large as those of VSL#3. Surprisingly, therapeutic use of probiotics has not gained wide popularity yet. Nevertheless, there are anecdotal reports and public interest in the use of these probiotics in ulcerative colitis and other gut disorders.

G&H How will increasing knowledge about probiotics in the United States impact eating habits as a society?

MF As knowledge increases, the use of probiotics will obviously increase. Financial studies reveal that there is a marked increase in the purchase of probiotic products, and it continues at a steady and slow pace worldwide. The purchase of these products is common in China, Japan, Korea, and Europe, but there are few good clinical trials about their therapeutic value because, as mentioned, they are considered to be GRAS.

G&H Are there any safety concerns to be aware of regarding probiotic supplements?

MF The only circumstance in which problems may arise is in persons with severe autoimmune diseases, such as severe HIV infection. There have been a few reports of superinfections in such persons. However, the tremendous use of probiotics and the few reports of an occasional associated infection is testimony to the safety of probiotics. Their GRAS status and the available research encourage wide use without control and without requirements that specific probiotics be used in certain conditions, as recommended by our physician study group.

G&H Where can we learn more about probiotics based on the work of your study group at Yale?

MF The study group at Yale formed because colleagues and I were very interested in the literature on probiotics but also realized that the literature was limited. The study group gathered at Yale 3 times within the past decade. Our specific clinical recommendations, developed at each meeting, were published in supplements to the *Journal of Clinical Gastroenterology* in 2006, 2008, and 2011, and I encourage readers to familiarize themselves with them. (Floch MH, et al. Recommendations for probiotic use. *J Clin Gastroenterol.* 2006;40[3]:275-278, 2008;42[suppl 2]:S104-S108, and 2011;45[suppl]:S168-S171.) The fourth meeting is scheduled for March 20, 2015 and will take place at Yale.

The 3 Yale meetings resulted in consensus opinions in numerous subjects, giving specific results in areas such as pediatric diarrhea, antibiotic-associated diarrhea, the potential inflammatory bowel disease-associated pouchitis, ulcerative colitis, Crohn's disease, and IBS. The recommendations of these workshops were graded according to the strength of specific articles in the literature that the consensus panel thought were strong enough to support the recommendations.

Dr Floch is on the medical board of Dannon.

Suggested Reading

- Floch MH. Probiotics, probiotics and dietary fiber. In: Buchman AL, ed. *Clinical Nutrition in Gastrointestinal Disease*. Thorofare, NJ: Slack Inc; 2006:123-139.
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- Gibson GR, Roberfroid MB. Dietary modulation of the human colonic microbiota: introducing the concept of prebiotics. *J Nutr.* 1995;125(6):1401-1412.
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