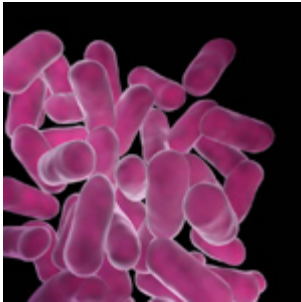


Getting To Know "Friendly Bacteria"



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Lactobacillus bacteria

If you go to the supermarket, or look at a health magazine or commercial Web site, chances are you will find products with "probiotics"--certain types of bacteria that are also called "friendly bacteria" or "good bacteria." Probiotics are available as conventional foods and dietary supplements (for example, capsules, tablets, and powders), and in some other forms as well. While some probiotic foods date back to ancient times (fermented foods and cultured milk products), recently interest in probiotics in general has been growing. Americans' spending on probiotic supplements, for example, nearly tripled from 1994 to 2003.

What Are Probiotics?

Experts have debated how to define probiotics more specifically. One widely used definition, developed by the United Nations Food and Agricultural Organization and the World Health Organization, calls **probiotics** "live microorganisms, which, when administered in adequate amounts, confer a health benefit on the host." (Microorganisms are tiny living organisms--such as bacteria, viruses, and fungi--that can be seen only under a microscope.) Probiotics are not the same thing as **prebiotics**--nondigestible food ingredients that selectively stimulate the growth and/or activity of bacterial species already in people's colons. When probiotics and prebiotics are mixed together, they form something else, a **synbiotic**.

Some conventional foods containing probiotics are yogurt, fermented and unfermented milk, miso, tempeh, and some juices and soy beverages. In those foods, and in probiotic supplements, the bacteria may have been present originally or added during preparation. Most often, they come from two groups of bacteria, *Lactobacillus* or *Bifidobacterium*. Within each group, there are different species (for example, *Lactobacillus acidophilus* and *Bifidobacterium bifidus*), and within each species, different strains (or varieties).

Scientific understanding of probiotics and their potential for preventing and treating health conditions is at an early stage, but moving ahead. In November 2005, a conference that was cofunded by NCCAM and convened by the American Society for Microbiology explored this topic.

A Balance of Bacteria

Why this interest in probiotics? It starts on a universal scale; the world is full of microorganisms (including bacteria), and so are people's bodies--in and on the skin, in the gut, and in other orifices. They take up residence in babies soon after birth. Friendly bacteria are vital to proper development of the immune system, to protection against agents that could cause disease, and to the digestion and absorption of food and nutrients. Each person's mix of bacteria varies. Interactions between a person and the microorganisms in his body, and between the microorganisms themselves, can be crucial to the person's health and well-being.

This bacterial "balancing act" can be thrown off in two major ways:

1. By antibiotics, when they kill friendly bacteria in the gut along with unfriendly bacteria. Some people use probiotics to try to offset side effects from antibiotics like gas, cramping, or diarrhea. Similarly, some use them with the intent to ease symptoms of lactose intolerance, a condition in which the gut cannot digest significant amounts of lactose, the major sugar in milk.
2. "Unfriendly" microorganisms such as disease-causing bacteria, yeasts, fungi, and parasites can also upset the balance. Researchers are exploring whether probiotics could halt these unfriendly agents in the first place and/or suppress their growth and activity in conditions like:
 - Traveler's diarrhea
 - Irritable bowel syndrome
 - Inflammatory bowel disease (e.g., ulcerative colitis and Crohn's disease)
 - Infection with *Helicobacter pylori* (*H. pylori*), a bacterium that causes most ulcers and many types of chronic stomach inflammation
 - Tooth decay and periodontal disease
 - Vaginal infections
 - Stomach and respiratory infections that children acquire in daycare
 - Skin infections

Other Aspects To Explore

Another part of the interest in probiotics stems from the fact that there are cells in the digestive tract connected with the immune system. One theory goes that if you alter the

microorganisms in a person's intestinal tract (as by introducing probiotic bacteria), you can affect his immune system's defenses.

Some other areas of research interest in probiotics are:

- What is going on at the molecular level with the bacteria themselves and their interactions with the body (such as the gut and its bacteria). Advances in technology and medicine are making it possible to study these areas much better than in the past.
- Issues of quality. For example, what happens when probiotic bacteria are treated or are added to foods--is their ability to survive, grow, and have a therapeutic effect altered?
- The best ways to administer probiotics for therapeutic purposes, as well as the best doses and schedules.
- Probiotics' safety. Among the issues, besides those connected with quality, are that:

Probiotic products taken by mouth are manufactured and regulated as foods, not drugs. Their quality (e.g., their identity, potency, purity, and shelf life) can vary--even from lot to lot or bottle to bottle.

Some microorganisms have a long history of use as probiotics without a conclusive risk to people. Probiotics' side effects, if any, tend to be mild and digestive (such as gas or bloating). However, more serious effects have been seen in some study participants. Probiotics might theoretically cause systemic infections, unhealthy metabolic activities, excessive immune stimulation, or gene transfer (insertion of genetic material into a cell).

More information is especially needed on probiotics' safety for young children, elderly people, and people with compromised immune systems.

- Probiotics' potential to help with the problem of antibiotic-resistant bacteria in the gut.
- Whether they can prevent unfriendly bacteria from getting through the skin or mucous membranes and traveling through the body (e.g., when a person has burns, shock, trauma, or suppressed immunity).



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Worldwide, almost 2 million children under
5 years old die from diarrhea each year.

Do Probiotics Work?

According to the conference report, some uses for which there is some encouraging evidence from study of specific probiotic formulations are as follows:

- To treat diarrhea (this is the strongest area of evidence, especially for diarrhea from rotavirus)
- To prevent and treat infections of the urinary or reproductive systems, such as urinary tract infections and bacterial vaginosis
- To treat irritable bowel syndrome
- To reduce recurrence of bladder cancer
- To shorten how long an intestinal infection that is caused by a bacterium called *Clostridium difficile* lasts
- To prevent and treat pouchitis (a condition that can follow surgery to remove the colon)
- To prevent and manage atopic dermatitis (eczema) in children

An NCCAM call for research (cosponsored with the NIH Office of Dietary Supplements) also briefly talks about effectiveness, with a focus on pediatrics:

Probiotics have traditionally been thought to be useful in the treatment of various gastrointestinal diseases. One of the primary areas of research in children has been in the treatment and prevention of diarrhea.... Some studies in adults show a reduction of symptoms associated with irritable bowel syndrome. Newer areas of research include systemic immune responses (including atopic eczema) that accompany food-related allergies in children. In addition, there is some evidence that probiotics enhance antibody response to vaccines, and decrease occurrence of respiratory and ear infections. Other potential indications for use in children include the treatment of inflammatory bowel disease, necrotizing enterocolitis, small bowel bacterial overgrowth, juvenile rheumatoid arthritis, and vaginitis, as well as the prevention of mother-baby transmission of HIV, recurrent urinary tract infections, and tumors preceding the development of cancer. (grants.nih.gov/grants/guide/pa-files/pa-06-426.html) The conference panel also noted that in studies of probiotics as cures, any effectiveness was usually low; a strong placebo effect often occurs; and more research (especially in the form of large, carefully designed clinical trials) is needed in order to draw firmer conclusions.

Advice to Consumers

If you are a consumer who is thinking about using a probiotic product as complementary and alternative medicine (CAM), consult your health care provider first. No CAM therapy should be used in place of conventional medical care or to delay seeking that care. Also, if you use a probiotic product and experience an effect that concerns you, contact your provider. You can read research on this CAM therapy's effectiveness and safety through the resources PubMed and CAM on PubMed. Keep in mind that effects from one strain of probiotics do not necessarily hold true for other strains, or even for other preparations of the same strain.

In sum, there is limited evidence supporting some uses of probiotics. Better scientific understanding these tiny forms of life and their effects on people is needed.

References

1994-2004 U.S. specialty/other supplement sales. *Nutrition Business Journal*. 2005. Accessed on July 19, 2006.

American Society for Microbiology. *Probiotic Microbes: The Scientific Basis*. Report of a colloquium held November 5-7, 2005, in Baltimore, Maryland. Accessed at on July 19, 2006.

Bifidobacteria. Natural Medicines Comprehensive Database Web site. Accessed on July 19, 2006.

Bifidus. Thomson MICROMEDEX AltMedDex System Web site. Accessed on July 19, 2006.

Doron S, Gorbach SL. Probiotics: their role in the treatment and prevention of diseases. *Expert Review of Anti-Infective Therapy*. 2006;4(2):261-275.

Ezendam J, van Loveren H. Probiotics: immunomodulation and evaluation of safety and efficacy. *Nutrition Reviews*. 2006;64(1):1-14.

Food and Agriculture Organization (FAO) of the United Nations and World Health Organization (WHO). *Guidelines for the Evaluation of Probiotics in Food*. Joint FAO and WHO Working Group Report on Drafting Guidelines for the Evaluation of Probiotics in Food. London, Ontario, Canada; 2002. Accessed at fda.gov/ohrms/dockets/dockets/95s0316/95s-0316-rpt0282-tab-03-ref-19-joint-faowho-vol219.pdf on July 19, 2006.

Gill HS, Guarner F. Probiotics and human health: a clinical perspective. *Postgraduate Medical Journal*. 2004;80(947):516-526.

Lactobacillus. Natural Medicines Comprehensive Database Web site. Accessed on July 19, 2006.

Lactobacillus. Thomson MICROMEDEX AltMedDex System Web site. Accessed on July 19, 2006.

Probiotics: Bottom Line Monograph. Natural Standard Database Web site. Accessed July 19, 2006.

Reid G, Hammond J. Probiotics: some evidence of their effectiveness. *Canadian Family Physician*. 2005;51:1487-1493.

Salminen SJ, Gueimonde M, Isolauri E. Probiotics that modify disease risk. *Journal of Nutrition*. 2005;135(5):1294-1298.

Vanderhoof JA, Young RJ. Current and potential uses of probiotics. *Annals of Allergy, Asthma, & Immunology*. 2004;93(5 suppl 3):S33-S37.

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