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NATIONAL CENTER FOR COMPLEMENTARY AND ALTERNATIVE MEDICINE

An Introduction to Probiotics

Probiotics are live microorganisms (in most cases, bacteria) that are similar to beneficial microorganisms found in the human gut. They are also called "friendly bacteria" or "good bacteria." Probiotics are available to consumers mainly in the form of dietary supplements and foods. They can be used as complementary and alternative medicine (CAM).[1] To find out more about topics and resources mentioned in this fact sheet, see "For More Information."

Key Points

- People use probiotic products as CAM to prevent and treat certain illnesses and support general wellness.
- There is limited evidence supporting some uses of probiotics. Much more scientific knowledge is needed about probiotics, including about their safety and appropriate use.
- Effects found from one species or strain of probiotics do not necessarily hold true for others, or even for different preparations of the same species or strain.
- Tell your health care providers about any CAM practices you use. Give them a full picture of what you do to manage your health. This will help ensure coordinated and safe care. For tips for talking with your health care providers about CAM, see NCCAM's Time to Talk campaign at nccam.nih.gov/timetotalk/.

What Probiotics Are

Experts have debated how to define probiotics. One widely used definition, developed by the World Health Organization and the Food and Agriculture Organization of the United Nations, is that probiotics are "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 yeasts—that can be seen only under a microscope.)

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[1] CAM is a group of diverse medical and health care systems, practices, and products that are not presently considered to be part of conventional medicine. Complementary medicine is used **together with** conventional medicine, and alternative medicine is used **in place of** conventional medicine. Some health care providers practice both CAM and conventional medicine.

Probiotics are not the same thing as **prebiotics**—nondigestible food ingredients that selectively stimulate the growth and/or activity of beneficial microorganisms already in people's colons. When probiotics and prebiotics are mixed together, they form a **synbiotic.**

Probiotics are available in foods and dietary supplements (for example, capsules, tablets, and powders) and in some other forms as well. Examples of foods containing probiotics are yogurt, fermented and unfermented milk, miso, tempeh, and some juices and soy beverages. In probiotic foods and supplements, the bacteria may have been present originally or added during preparation.

Most probiotics are bacteria similar to those naturally found in people's guts, especially in those of breastfed infants (who have natural protection against many diseases). Most often, the bacteria come from two groups, *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). A few common probiotics, such as *Saccharomyces boulardii*, are yeasts, which are different from bacteria.

Some probiotic foods date back to ancient times, such as fermented foods and cultured milk products. Interest in probiotics in general has been growing; Americans' spending on probiotic supplements, for example, nearly tripled from 1994 to 2003.

Uses for Health Purposes

There are several reasons that people are interested in probiotics for health purposes.

First, 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. Friendly bacteria are vital to proper development of the immune system, to protection against microorganisms 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 among 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 to ease symptoms of lactose intolerance—a condition in which the gut lacks the enzyme needed to digest significant amounts of the major sugar in milk, and which also causes gastrointestinal symptoms.

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:

    - Infectious 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.

Another part of the interest in probiotics stems from the fact there are cells in the digestive tract connected with the immune system. One theory is that if you alter the microorganisms in a person's intestinal tract (as by introducing probiotic bacteria), you can affect the immune system's defenses.

What the Science Says

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 the National Center for Complementary and Alternative Medicine (NCCAM) and convened by the American Society for Microbiology explored this topic.

According to the conference report, some uses of probiotics for which there is some encouraging evidence from the 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 tract or female genital tract
- To treat irritable bowel syndrome
- To reduce recurrence of bladder cancer
- To shorten how long an intestinal infection lasts that is caused by a bacterium called *Clostridium difficile*
- To prevent and treat pouchitis (a condition that can follow surgery to remove the colon)
- To prevent and manage atopic dermatitis (eczema) in children.

The conference panel also noted that in studies of probiotics as cures, any beneficial effect 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.

Some other areas of interest to researchers on probiotics are

- What is going on at the molecular level with the bacteria themselves and how they may interact with the body (such as the gut and its bacteria) to prevent and treat diseases. 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' 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., which can happen with burns, shock, trauma, or suppressed immunity).

Side Effects and Risks

Some live microorganisms have a long history of use as probiotics without causing illness in people. Probiotics' safety has not been thoroughly studied scientifically, however. More information is especially needed on how safe they are for young children, elderly people, and people with compromised immune systems.

Probiotics' side effects, if they occur, tend to be mild and digestive (such as gas or bloating). More serious effects have been seen in some people. Probiotics might theoretically cause infections that need to be treated with antibiotics, especially in people with underlying health conditions. They could also cause unhealthy metabolic activities, too much stimulation of the immune system, or gene transfer (insertion of genetic material into a cell).

Probiotic products taken by mouth as a dietary supplement are manufactured and regulated as foods, not drugs.

Some Other Points To Consider

- If you are thinking about using a probiotic product as 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.
- Effects from one species or strain of probiotics do not necessarily hold true for others, or even for different preparations of the same species or strain.
- If you use a probiotic product and experience an effect that concerns you, contact your health care provider.
- You can locate research reports in peer-reviewed journals on probiotics' effectiveness and safety through the resources PubMed and CAM on PubMed.

NCCAM-Sponsored Research on Probiotics

Among recent NCCAM-sponsored research are the following projects:

- Investigators at Tulane University School of Public Health and Tropical Medicine are studying the effectiveness of selected probiotic agents to treat diarrhea in undernourished children in a developing country.

- At the Mayo Clinic College of Medicine, researchers have been examining probiotics for possibly decreasing the levels of certain substances in the urine that can cause problems such as kidney stones.
- A team at Tufts-New England Medical Center is studying probiotics for treating an antibiotic-resistant type of bacteria that causes severe infections in people who are hospitalized, live in nursing homes, or have weakened immune systems.

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For More Information

NCCAM Clearinghouse

The NCCAM Clearinghouse provides information on CAM and NCCAM, including publications and searches of Federal databases of scientific and medical literature. The Clearinghouse does not provide medical advice, treatment recommendations, or referrals to practitioners.

Toll-free in the U.S.: 1-888-644-6226
TTY (for deaf and hard-of-hearing callers): 1-866-464-3615
Web site: nccam.nih.gov
E-mail: info@nccam.nih.gov

PubMed®

A service of the National Library of Medicine (NLM), PubMed contains publication information and (in most cases) brief summaries of articles from scientific and medical journals. CAM on PubMed, developed jointly by NCCAM and NLM, is a subset of the PubMed system and focuses on the topic of CAM.

Web site: www.ncbi.nlm.nih.gov/sites/entrez
CAM on PubMed: nccam.nih.gov/camonpubmed/

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