



## Probiotics (*Bifidobacterium*, *Lactobacillus*, *Saccharomyces boulardii*)

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While some complementary and alternative techniques have been studied scientifically, high-quality data regarding safety, effectiveness, and mechanism of action are limited or controversial for most therapies. Whenever possible, it is recommended that practitioners be licensed by a recognized professional organization that adheres to clearly published standards. In addition, before starting a new technique or engaging a practitioner, it is recommended that patients speak with their primary healthcare provider(s). Potential benefits, risks (including financial costs), and alternatives should be carefully considered. The below monograph is designed to provide historical background and an overview of clinically-oriented research, and neither advocates for or against the use of a particular therapy.

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## Related Terms

- AB-yogurt, acidophilus, acidophilus milk, antibiophilus, *Bacillus*, bifidobacteria, *Bifidobacterium animalis* ssp. lactis (BB-12), *Bifidobacterium* DN-173 010, *Enterococcus*, *Enterococcus faecium* M-74, *Escherichia*, fermented soymilk, flora, fructo-oligosaccharides (FOS), *Helicobacter pylori*, *L. acidophilus* milk, *L. acidophilus* yogurt, lactic acid bacteria, lacto bacillus, Lactobacillaceae (family), lactobacilli, *Lactobacillus*, *Lactobacillus casei* DN-114 001, *Lactobacillus casei* shirota, *Lactobacillus coryniformis* CECT5711, *Lactobacillus gasseri* CECT5714, *Lactobacillus johnsonii* LA1, *Lactobacillus rhamnosus* GR-1, *Lactobacillus paracasei* ssp. paracasei (CRL-431), *Lactobacillus reuteri* B-54 and RC-14, Lakcid L, oligofructose, oral bacteriotherapy, prebiotic, *Saccharomyces boulardii*, VSL#3, yogurt.
- **Note:** There are many terms that identify specific varieties or forms of probiotics. Many such terms are used in the naming of commercial probiotic products. Probiotics should not be confused with prebiotics.

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## Background

- Probiotics are beneficial bacteria (sometimes referred to as "friendly germs") that help to maintain the health of the intestinal tract and aid in digestion. They also help keep potentially harmful organisms in the gut (harmful bacteria and yeasts) under control. Most probiotics come from food sources, especially cultured milk products. Probiotics can be consumed as capsules, tablets, beverages, powders, yogurts, and other foods.
- Probiotics should not be confused with prebiotics. Prebiotics are complex sugars (such as lactulose, lactitol, a variety of fructo-oligosaccharides, and inulin) that are used as fuel by healthful bacteria to stimulate their growth and activity while suppressing the growth and activity of harmful organisms. Other foods that may support probiotic activity include Japanese miso, tempeh, kefir, raw milk, kombucha, bananas, garlic, and onions. When prebiotics and probiotics are combined in one product, it is called a synbiotic.

- Probiotics are thought to work by colonizing the small intestine and crowding out disease-causing organisms, thereby restoring proper balance to the intestinal flora. They compete with harmful organisms for nutrients and may also produce substances that inhibit growth of harmful organisms in the gut.
- Probiotic bacteria have been found to stimulate the body's immune system. They may also aid in several gastrointestinal illnesses such as inflammatory bowel diseases, antibiotic-related diarrhea, *Clostridium difficile* toxin-induced colitis, infectious diarrhea, hepatic encephalopathy, irritable bowel syndrome, and allergies.
- Probiotics have been found to enhance the digestion and absorption of proteins, fats, calcium, and phosphorus. They may also help overcome lactose intolerance and restore healthful bacteria after a course of antibiotic therapy has altered the normal gastrointestinal flora.

## Scientific Evidence

Uses	Grade*
<p><i>These uses have been tested in humans or animals. Safety and effectiveness have not always been proven. Some of these conditions are potentially serious, and should be evaluated by a qualified healthcare provider.</i></p> <p><b><u>Acute diarrhea</u></b> An increasing number of studies support the use of probiotics as a supplement to antibiotic therapy, as a preventative for diarrhea originating in a healthcare setting in infants, and in healthy adults. Probiotic supplementation during a course of antibiotics may reduce the adverse effects of antibiotics in the intestinal environment. In acutely ill children, synbiotics have been linked to greater weight gain and fewer bacterial illnesses after antibiotics are ended. The evidence consistently supports supplementation of antibiotics.</p>	<u>A</u>
<p><b><u>Atopic dermatitis (eczema)</u></b> Probiotics show promise for preventing atopic eczema/dermatitis syndrome in children. Infants benefit when their mothers take probiotics during pregnancy and breastfeeding. Direct supplementation of infants may reduce the incidence of atopic eczema by as much as half. It may also reduce cow's milk allergy and other allergic reactions during weaning. Probiotics may stabilize the intestinal barrier function and decrease gastrointestinal symptoms in children with atopic dermatitis. Children do differ, however, in their responsiveness to specific probiotics. The effectiveness of probiotics for the treatment of eczema is still under investigation.</p>	<u>A</u>
<p><b><u>Cirrhosis</u></b> Liver cirrhosis may be accompanied by an imbalance of intestinal bacteria flora. Probiotic supplementation in cirrhosis patients has been found to reduce the level of fecal acidity (pH) and fecal and blood ammonia, which are beneficial changes.</p>	<u>B</u>
<p><b><u>Dental caries</u></b> Short-term consumption of probiotic-containing cheese may benefit dental caries. There is also evidence that the probiotic <i>Lactobacillus rhamnosus</i> GG, when added to milk, may help reduce dental caries in young children.</p>	<u>B</u>
<p><b><u>Growth</u></b> There is evidence that young children (ages 6-36 months) who receive infant formula with bifidobacteria Bb12 supplementation may achieve faster growth than without the supplementation. More research is needed to confirm available study findings.</p>	<u>B</u>
<p><b><u>Immune enhancement</u></b> Research suggests that probiotics, especially those in milk or food, may help boost the immune system. However, commercially produced yogurt may not be as effective. More studies are needed, particularly with yogurt, in order to reach a firm conclusion.</p>	<u>B</u>
<p><b><u>Irritable bowel syndrome (IBS)</u></b> Many types of probiotics have been shown to moderately reduce symptoms of IBS, including pain, gas, bloating, and stool frequency. There is also some evidence that probiotics may reduce swelling and improve quality of life. However, not all studies show beneficial effects.</p>	<u>B</u>



Gradin System

<p><b><u>Pancreatitis (acute)</u></b>  Supplementing with <i>Lactobacillus plantarum</i> 299 may help prevent pancreatic infection (sepsis), reduce the number of operations needed, and reduce the length of hospital stay in treatment of acute pancreatitis.</p>	<u><b>B</b></u>
<p><b><u>Sinusitis (hypertrophic)</u></b>  Use of probiotic <i>Enterococcus faecalis</i> bacteria in hypertrophic sinusitis (sinus inflammation) may reduce frequency of relapses and the need for antibiotic therapy.</p>	<u><b>B</b></u>
<p><b><u>Ulcerative colitis</u></b>  <i>E. coli</i> Nissle 1917 appears to be as effective as the drug mesalazine, but is not currently available in the United States. A variety of <i>Bifidophilus</i> preparations have shown effects of preventing relapse or maintaining remission. These include <i>Bifidophilus</i> alone, <i>Bifidophilus</i> in fermented milk products, and a synbiotic preparation. A probiotic combination consisting of VSL#3 plus balsalazide may be more effective than balsalazide or mesalazine alone. More studies are needed to more clearly determine what outcomes can be expected.</p>	<u><b>B</b></u>
<p><b><u>Allergies</u></b>  There is promising early evidence that probiotics may help treat allergic conditions, especially allergic skin disorders in infants. Most studies have tested probiotics in children, teenagers, and young adults. Some evidence also suggests that probiotics help reduce swelling caused by allergies. However, study results are mixed for inhalant allergies, such as allergic rhinitis (nasal inflammation and discharge).</p>	<u><b>C</b></u>
<p><b><u>Amoebiasis</u></b>  Combining a probiotic yeast (<i>Saccharomyces boulardii</i>) with antibiotics in the treatment of acute amoebiasis (amoebic dysentery) may decrease the duration of symptoms. More studies are needed in this area.</p>	<u><b>C</b></u>
<p><b><u>Asthma</u></b>  Laser acupuncture plus probiotics may help prevent asthma attacks in school-aged children with intermittent or mild persistent asthma. More research with probiotics alone is needed.</p>	<u><b>C</b></u>
<p><b><u>Bacterial vaginosis (during pregnancy)</u></b>  Vaginal suppositories containing probiotics may be effective in the treatment or prevention of bacterial vaginosis. Eating yogurt enriched with <i>Lactobacillus acidophilus</i> may also be beneficial. However, not all applications of probiotics show benefit. Additional research is necessary before firm conclusions can be reached regarding what probiotics and what methods can lead to reliable results.</p>	<u><b>C</b></u>
<p><b><u>Cardiovascular disease</u></b>  There is limited evidence suggesting that probiotics may help reduce low density lipoprotein (LDL or "bad") cholesterol, a risk factor for cardiovascular disease, in overweight people. One study suggests that probiotic supplementation may reduce blood pressure and some biochemical risk factors for cardiovascular disease (leptin and fibrinogen). This implies a possible protective effect against atherosclerosis. These findings are tentative and more evidence is needed to arrive at firm conclusions.</p>	<u><b>C</b></u>
<p><b><u>Colitis (collagenous)</u></b>  There is not enough evidence on which to form conclusions on the use of probiotics in collagenous colitis. A lack of a significant effect was observed in available study. More research is needed in this area.</p>	<u><b>C</b></u>
<p><b><u>Colon cancer</u></b>  There is recent evidence that supplementation with a synbiotic preparation (oligofructose-enriched insulin, <i>Lactobacillus rhamnosus</i> GG (LGG), <i>Bifidobacterium lactis</i> Bb12 (BB12)) may help reduce the risk of colon cancer. More studies with probiotics as a monotherapy are needed.</p>	<u><b>C</b></u>
<p><b><u>Constipation</u></b>  Results of studies using probiotics for constipation are mixed. Some research suggests that they may help reduce symptoms in patients with long-term constipation. However, other studies did not show effectiveness in young children. More research is needed to determine what forms of probiotics may be effective in constipation.</p>	<u><b>C</b></u>
<p><b><u>Crohn's disease</u></b>  Based on a limited number of studies, probiotics have not demonstrated efficacy in clinical symptoms associated with Crohn's disease. More well designed studies are needed.</p>	<u><b>C</b></u>

<p><b><u>Diarrhea (HIV patients on antiretroviral therapy)</u></b>  Probiotic therapy is well tolerated in HIV infected patients on antiretroviral therapy, but may not be helpful for gastrointestinal symptoms. More studies are needed in this area.</p>	<p><u>C</u></p>
<p><b><u>Ear infections</u></b>  Probiotic capsules (containing <i>Lactobacillus rhamnosus</i> GG and LC705, <i>Bifidobacterium breve</i> 99, and <i>Propionibacterium freudenreichii</i> JS) have not been shown to protect against ear infections in children. More research is needed to confirm these findings.</p>	<p><u>C</u></p>
<p><b><u>Fertility</u></b>  Probiotics have been used in the vagina immediately after oocyte (egg) retrieval during <i>in vitro</i> fertilization (IVF), but they do not appear to have an effect on vaginal colonization or pregnancy rate in IVF cycles. More studies are needed.</p>	<p><u>C</u></p>
<p><b><u>Helicobacter pylori infection (therapy-related side effects)</u></b>  Antibiotics are the main treatment to eradicate <i>Helicobacter pylori</i>, the cause of most stomach ulcers. Side effects commonly include bloating, diarrhea, and taste disturbances. Probiotics reduce these side effects and generally help people tolerate the treatment. They may also reduce levels of <i>H. pylori</i> in children and adults. Yogurt containing probiotics suppresses <i>H. pylori</i> infection and may lead to more complete eradication during antibiotic treatment.</p>	<p><u>C</u></p>
<p><b><u>Hepatic encephalopathy (confused thinking due to liver disorders)</u></b>  Initial studies in minimal hepatic encephalopathy are encouraging. Probiotics and prebiotics may lead to the improvement of symptoms and may be an alternative to lactulose for the management of this condition in people with cirrhosis. However, more studies are needed to better understand the role of probiotics in this condition.</p>	<p><u>C</u></p>
<p><b><u>Infection prevention</u></b>  There is limited evidence that probiotic supplementation may reduce the presence of harmful bacteria in the upper respiratory tract. More studies are needed to establish this relationship and its implications for health.</p>	<p><u>C</u></p>
<p><b><u>Lactose intolerance</u></b>  Supplementation of infant formulas with probiotics is a potential approach for the management of cow's milk allergy, but there is conflicting evidence as to whether it improves digestion of lactose. More research is needed in this area before a conclusion can be drawn.</p>	<p><u>C</u></p>
<p><b><u>Necrotizing enterocolitis (NEC) prevention</u></b>  Little evidence is available on the effects of probiotics in the prevention of NEC. Study results conflict. Further studies are needed to determine the effectiveness of this application.</p>	<p><u>C</u></p>
<p><b><u>Pneumonia</u></b>  There is insufficient evidence to draw any firm conclusions on the use of probiotics for pneumonia. More research is necessary.</p>	<p><u>C</u></p>
<p><b><u>Pouchitis</u></b>  Limited evidence suggests that a probiotic preparation (VSL#3, containing lactobacilli, bifidobacteria, and <i>Streptococcus salivarius</i> subspecies <i>thermophilus</i>) may be effective in the prevention of pouchitis. Notably, discontinuation appears to be followed by relapse, while continuation apparently maintains remission and better quality of life. <i>Lactobacillus</i> GG supplementation, however, has had conflicting results in preventing flare-ups. More studies are needed to arrive at firm conclusions.</p>	<p><u>C</u></p>
<p><b><u>Rheumatoid arthritis (RA)</u></b>  <i>Lactobacillus</i> GG has been associated with some improvements in subjective well-being and symptoms of rheumatoid arthritis. More studies are needed.</p>	<p><u>C</u></p>
<p><b><u>Supplementation in preterm and very low birthweight infants</u></b>  Probiotics, when added to formulas or breast milk, may foster better growth and higher counts of healthy bacteria in the gut of preterm infants. They may also boost the immune system and improve feeding tolerance. However, <i>Lactobacillus</i> GG may not be effective. More studies are needed to clarify specific guidelines for probiotics in preterm infant care.</p>	<p><u>C</u></p>

<b><u>Thrush</u></b> Early research suggests that cheese-containing probiotics may help reduce the risk of a fungal mouth infection, called thrush. More research is needed in this area.	<a href="#"><u>C</u></a>
<b><u>Urinary tract infection</u></b> Studies of <i>Lactobacillus</i> preparations for urinary tract infection have had mixed results. Available evidence suggests that a combination of <i>Lactobacillus rhamnosus</i> GR-1 and <i>L. fermentum</i> RC-14 may reduce potentially harmful vaginal bacteria and yeast in healthy women. Other studies have found no benefit for women or pre-term infants. More studies are needed to determine the effectiveness of probiotics in urinary and urogenital tract infections.	<a href="#"><u>C</u></a>
<b><u>Vaccine adjunct</u></b> <i>Lactobacillus fermentum</i> (CECT5716) may increase the protective effects of the flu vaccine. More research is needed.	<a href="#"><u>C</u></a>
<b><u>Vaginal candidiasis (yeast infection)</u></b> Probiotics have not been adequately studied for the prevention or treatment of vaginal yeast infections. More research is needed in this area before a conclusion can be drawn.	<a href="#"><u>C</u></a>

## Tradition/Theory

*The below uses are based on tradition, scientific theories, or limited research. They often have not been thoroughly tested in humans, and safety and effectiveness have not always been proven. Some of these conditions are potentially serious, and should be evaluated by a qualified healthcare provider. There may be other proposed uses that are not listed below.*

- Acne, anti-inflammatory, asthma, bad breath, bone marrow transplantation, cancer, canker sores, cystic fibrosis (respiratory and gastrointestinal problems), diaper rash, diverticulitis, *E. coli* infection in cancer patients, fever blisters, gastroenteritis, heartburn, HIV, hives, hormonal imbalances, indigestion, osteoporosis prevention, tuberculosis.

## Dosing

*The below doses are based on scientific research, publications, traditional use, or expert opinion. Many herbs and supplements have not been thoroughly tested, and safety and effectiveness may not be proven. Brands may be made differently, with variable ingredients, even within the same brand. The below doses may not apply to all products. You should read product labels, and discuss doses with a qualified healthcare provider before starting therapy.*

### Adults (over 18 years old)

- Probiotics are available as capsules, yogurts, powder, and dairy products. Various doses have been studied, however, the effectiveness of these doses is unclear. The most common probiotics are *Lactobacillus*, *Saccharomyces*, and *Bifidobacterium*.

### Children (under 18 years old)

- Various doses and probiotic strains have been studied in children, however, the effectiveness of these doses remains unclear.

## Safety

*The U.S. Food and Drug Administration does not strictly regulate herbs and supplements. There is no guarantee of strength, purity or safety of products, and effects may vary. You should always read product labels. If you have a medical condition, or are taking other drugs, herbs, or supplements, you should*

*Speak with a qualified healthcare provider before starting a new therapy. Consult a healthcare provider immediately if you experience side effects.*

### **Allergies**

- Probiotics are often found in yogurt, milk, dairy products, and juices. Caution is advised in patients sensitive or intolerant to dairy products containing probiotics or to fruits that may be contained in the juices. Lactose-sensitive people may develop abdominal discomfort from dairy products containing probiotics. Avoid with known allergy or sensitivity to probiotics.

### **Side Effects and Warnings**

- Probiotics are generally regarded as safe for human consumption. Few side effects have been reported.
- Some people experience excessive production of gas due to the corrective activity of probiotics in the colon. This is patient-specific and normally will decrease with use. Gradual increase of dosing over time is recommended to minimize this effect.
- Use cautiously in patients prone to infections or those with compromised immune systems, such as those with HIV/AIDS, or in infants born prematurely or those with immune deficiency.
- Use cautiously in patients with gastrointestinal disorders or in those sensitive or intolerant to dairy products containing probiotics. Lactose-sensitive people may develop abdominal discomfort from dairy products containing probiotics.
- Avoid with known allergy or sensitivity to probiotics.

### **Pregnancy and Breastfeeding**

- Although probiotics (when consumed as dairy products or yogurt) appear safe during pregnancy and breastfeeding, additional study is needed. Caution is advised when using probiotics in neonates born prematurely or with immune deficiency.

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## **Interactions**

*Most herbs and supplements have not been thoroughly tested for interactions with other herbs, supplements, drugs, or foods. The interactions listed below are based on reports in scientific publications, laboratory experiments, or traditional use. You should always read product labels. If you have a medical condition, or are taking other drugs, herbs, or supplements, you should speak with a qualified healthcare provider before starting a new therapy.*

### **Interactions with Drugs**

- Probiotics may interact with anti-inflammatory agents, agents that affect the immune system, and vaccines.

### **Interactions with Herbs and Dietary Supplements**

- Probiotics may interact with anti-inflammatory herbs and supplements and herbs and supplements that affect the immune system.

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## **Author Information**

- This information is based on a systematic review of scientific literature edited and peer-reviewed by contributors to the Natural Standard Research Collaboration ([www.naturalstandard.com](http://www.naturalstandard.com)).

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## References

*Natural Standard developed the above evidence-based information based on a thorough systematic review of the available scientific articles. For comprehensive information about alternative and complementary therapies on the professional level, go to [www.naturalstandard.com](http://www.naturalstandard.com). Selected references are listed below.*

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