

## Probiotics- By Consumer Labs

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### What They Are:

Probiotic products contain helpful, viable bacteria and/or yeasts that assist in balancing the levels of indigenous microorganisms in the human body.

Probiotics are available in varied forms such as yogurt and other cultured milk foods, capsules, tablets, beverages, and powders. Probiotics should not be confused with [prebiotics](#), which are complex sugars (such as inulin and other fructo-oligosaccharides) that are ingested as fuel for bacteria already present in the gastrointestinal tract. Prebiotics and probiotics are sometimes combined in the same product and termed synbiotics.

### What They Do:

The normal human gastrointestinal tract contains hundreds of different species of bacteria, referred to as intestinal flora. When the normal balance of these bacteria is disturbed by illness or antibiotic treatment, the most common effect is diarrhea. Probiotics work by re-colonizing the small intestine and crowding out disease-causing bacteria, thereby restoring balance to the intestinal flora. They may also produce substances that inhibit disease-causing bacteria, compete for nutrients with them, and stimulate the body's own immune system.

A variety of probiotic organisms (alone or in combination) have been tested in clinical trials for a range of conditions. Here are some of the most notable findings by condition:

#### Irritable bowel syndrome (IBS) and abdominal pain

*Bifidobacterium infantis* 35624 (used in Proctor & Gamble's Align) was found to improve symptoms (e.g., bloating, straining, gas) of irritable bowel syndrome (IBS) in women, although it did not change the frequency of stools ([Whorwell 2006](#)). An eight-strain combination of *Lactobacillus*, *Bifidobacterium* and *Streptococcus* (known as VSL#3) reduced abdominal bloating in patients with diarrhea-predominant IBS but had no effect on other symptoms such as abdominal pain, gas and urgency ([Kim 2003](#)). Studies with *Lactobacillus* GG, *Lactobacillus plantarum*, and *Lactobacillus*

salivarius have not shown benefit with IBS in adults.

Some yogurts are now fortified with additional probiotic strains and have been marketed as promoting "digestive health," although it is not clear if they can help with IBS. Bifidobacterium lactis (BB-12) is added to YoPlus yogurt and Bifidobacterium animalis DN-173 010 (trade named "Bifidus regularis") is in Dannon's Activia yogurt. Clinical trials on both probiotic strains have shown that they shorten the transit time of food in the bowel; speeding up the time for food to pass through the bowel may benefit people with constipation, but it is not necessarily beneficial for people who complain of frequent or loose stools. A dosing study with BB-12 showed looser stools with increasing probiotic dose (which ranged from 100 million to 100 billion cells per day) ([Larsen 2006](#)).

A study of yogurt containing Bifidobacterium animalis DN-173 010 (as in Activia) including yogurt starter cultures *S. thermophilus* and *L. bulgaricus* found that after 4 weeks of eating two cups (each 125 grams, non-flavored) daily, 57% of people with IBS involving constipation reported adequate symptom relief. However, among those in a control group eating a similar yogurt product which had been heated to kill the probiotic organisms, an almost equal amount of people (54%) reported relief, indicating no significant benefit of the probiotic over the non-probiotic. After eating the products for 8 weeks, 68% of those in the non-probiotic group reported adequate relief compared to just 46% of those who had taken the probiotic; and at 12 weeks this increased to 76% for the non-probiotic eaters and remained at 46% for the probiotic eaters. The researchers concluded that people with IBS may benefit from regular consumption of a fermented dairy product, like yogurt, but the addition of this particular probiotic would not be expected to provide further benefit ([Roberts, BMC Gastroent 2013](#)).

Advertising claims on Activia (as well as related DanActive drinks) indicating them to be "clinically proven" and "scientifically proven" to aid digestion have been (or are being) modified to read "clinical studies show..." as a result of [lawsuits in the U.S. and Canada](#).

Some clinical studies suggest that prebiotics may improve symptoms of IBS, but results have been mixed. For more information about fructo-oligosaccharides and other [Prebiotics](#) see the article in the Encyclopedia on this website.

A study of children (aged 5 to 14) with IBS showed that taking Lactobacillus GG (a strain of Lactobacillus casei which is used in Culturelle) (3 billion cells twice per day for 8 weeks) significantly reduced the frequency and severity of abdominal pain ([Ruggiero 2010](#)). The number of episodes of pain per week

decreased from 3.4 to 1.6 during treatment (a decrease of 4.0 to 3.2 was seen in the placebo-treated group). Episodes of pain fell even further during the follow-up period (8 weeks after therapy) to 0.9 per week in the probiotic group (1.6 in the placebo group). The treatment was well tolerated and no adverse effects were reported. A study of children (ages 6 to 16) with functional abdominal pain given *Lactobacillus reuteri* (200 million cells per day) for 4 weeks showed reduced intensity of abdominal pain in the treated children compared to those given placebo ([Romano 2010](#)).

### Diverticular disease

A study in 210 people with symptomatic uncomplicated diverticular disease (SUDD) found that treatment with a probiotic (*Lactobacillus casei* subsp. DG, 24 billion organisms) was nearly as effective as treatment with the drug mesalazine (1.6 grams) in reducing recurrence of symptoms, and combined treatment was more effective than either alone. The treatments were given for 10 consecutive days each month for one year. Over the year, the percentage of patients with recurrence of symptoms (abdominal pain lasting at least 24 hours) was 46% among patients who received only placebo, 14.5% among those who received the probiotic, 13.7% among those who received mesalazine only, and 0% for those receiving combination treatment ([Tursi, Aliment Pharm Ther 2013](#)). Mesalazine is believed to work by controlling inflammation while the probiotic may restore organisms in the colon.

### Diarrhea caused by antibiotics, viral infection, or chemotherapy

Antibiotics can disturb gastrointestinal organisms, and symptoms, such as diarrhea, may occur in as many as 30% of patients, particularly among older individuals. A 2012 review of over 60 published studies concluded that probiotic use was associated with an overall 42% lower risk of developing diarrhea due to antibiotic treatment ([Hempel, JAMA 2012](#)). There was a 36% lower risk of diarrhea across studies specifically using forms of *Lactobacillus* and a 52% lower risk of diarrhea across studies using the probiotic yeast *Saccharomyces*.

A subsequent review of 20 studies later in 2012 found a protective effect of probiotics in preventing *Clostridium difficile*-associated diarrhea, which is typically caused by exposure to broad-spectrum antibiotics and accounts for approximately one third of cases of antibiotic-associated diarrhea. The condition can be life-threatening and is most common in older, hospitalized individuals. Products with multiple species of probiotic organisms showed larger effects (75% risk reduction) than those using single species (50% risk reduction). People treated with probiotics reported fewer adverse events (e.g., cramping) than those who received placebo or no treatment, highlighting the safety of probiotics for this use. The review found a 66% reduction in the risk of

developing this condition when probiotics were given as opposed to when they were not ([Johnston, Ann Int Med 2012](#)). The results were similar in trials of adults and children. Each of the trials used at least 10 billion organisms daily.

A more recent study of hospitalized patients age 65 and older in the U.K. who were receiving oral or parenteral antibiotics did not find such a benefit for antibiotic-associated diarrhea or *Clostridium difficile* diarrhea. The multicenter, randomized, double blind, placebo-controlled trial of nearly 3,000 participants found that taking a probiotic containing a blend of *Lactobacillus acidophilus* CUL60 (NCIMB 30157) and two strains of *Bifidobacterium bifidum* CUL20 (NCIMB 30153) (a total of 60 billion bacteria per day) daily for 21 days did not reduce the occurrence of antibiotic-associated diarrhea, including *Clostridium difficile* diarrhea, when compared to placebo (10.8% and 10.4%, respectively)([Allen, Lancet 2013](#)).

Looking at specific strains, the probiotic yeast *Saccharomyces boulardii* (a strain found in FloraStor and FloraStor Kids) has been shown helpful in preventing antibiotic-induced diarrhea ([Cremonini 2002](#)). A probiotic drink (Actimel -- also sold as DanActive) containing *Lactobacillus casei*, *Lactobacillus bulgaricus*, and *Streptococcus thermophilus* consumed twice daily during antibiotic treatment and for a week thereafter, significantly decreased the risk of developing diarrhea, including *Clostridium difficile*-related diarrhea ([Hickson, 2007](#)). A study in China among hospitalized adults (aged 50 to 70) showed that capsules containing large doses of proprietary strains of *Lactobacillus acidophilus* and *Lactobacillus casei* significantly reduced antibiotic-associated diarrhea, including *Clostridium difficile*-related diarrhea ([Gao, 2010](#)).>

Another study in China showed greater overall efficacy with a higher dose of a probiotic than a lower dose. In this study of hospitalized adults aged 30 to 70, the incidence of antibiotic-associated diarrhea was reduced from 24.6% among those who received placebo to about half that amount (12.5%) among those receiving 17 billion probiotic bacteria per day. A group receiving only 4 billion bacteria per day had a non-significant decrease to 19.6%. The incidence specifically of *C. difficile*-associated diarrhea decreased from 4.8% in the placebo group to 1.8% in both treated groups. The higher dose probiotic treatment also significantly reduced the incidence of symptoms, particularly abdominal pain (19.2% placebo vs. 2.5% high-dose) ([Ouweland, Vaccine 2013](#)). A capsule containing the probiotic was taken 2 hours after breakfast (the antibiotic was taken with breakfast) on each day of antibiotic treatment and for 7 additional days. The probiotic used in the study consists of a combination of four bacteria in equal parts marketed as [HOWARU Restore](#) (found in [Active D'Lites](#) foods in the U.S. -- not yet tested by ConsumerLab.com). See [What to](#)

[Consider When Using -- Dosage](#) for more about this probiotic.

Lactobacillus GG and Lactobacillus reuteri have been shown to reduce the duration of diarrhea due to certain infections in infants and young children, but not adults. Lactobacillus GG has also been shown to reduce the risk of chemotherapy-induced diarrhea ([Osterlund 2007](#)). A dosing study ([Saxelin 1991](#)) using the bacteria in Culturelle (Lactobacillus GG) found that a daily dose of 1.5 billion cells was not able to colonize the gut, but a much larger dose, 15 billion cells, was. (Culturelle tested by ConsumerLab.com in this Review provides 10 billion cells in its suggested daily serving of one capsule.) Lactobacillus reuteri DSM 17938 (0.1 billion cells daily) given shortly after birth to preterm infants resulted in decreases in feeding intolerance and the duration of hospitalization compared to placebo, as well as a 40% (but not statistically significant) decrease in necrotizing enterocolitis ([Rojas, Pediatrics 2012](#)).

#### Traveler's diarrhea

Studies using oral probiotics have yielded both positive and negative results. Lactobacillus GG reduced the risk of traveler's diarrhea by 47% in a study involving 245 people who traveled to 14 world-wide geographic regions ([Hilton, 1997](#)). Saccharomyces boulardii reduced the likelihood of traveler's diarrhea by 13% (using 250 mg per day) to 26% (using 1 gram per day) in a study of 3,000 Austrian tourists who traveled in northern Africa, the Middle East and Far East. This study had a high drop-out rate of 34% ([Kollaritsch, 1993](#)). Three weeks of Lactobacillus fermentum KLD or Lactobacillus acidophilus failed to prevent traveler's diarrhea in a study of 282 British soldiers deployed to Belize ([Katelaris, 1995](#)). A combination of Lactobacillus acidophilus and Lactobacillus bulgaricus failed to prevent traveler's diarrhea in 50 travelers to Mexico ([de Dios Pozo-Olano, 1978](#)). The effectiveness of individual probiotic species for traveler's diarrhea may vary depending on the probiotic species used and the travel destination.

#### Helicobacter pylori (H. pylori) infection

Successful clinical trials have also been conducted using Lactobacillus alone or in combination with Bifidobacterium and Saccharomyces species to treat symptoms of H. pylori infection (a causative agent of stomach ulcers), but probiotics do not seem to eradicate the infection.

#### Vaginal bacterial infections

A combination of L. rhamnosus GR-1 and L. fermentum RC-14 (as in Jarrow Formulas femdophilus) taken orally has been shown to reduce colonization of the vagina by potential pathogenic bacteria and yeast ([Reid 2003](#)). Vaginal

suppositories (which are not considered supplements in the U.S.) containing Lactobacillus organisms have also shown therapeutic benefit.

### Cold and flu

Among healthy adults given 1 billion viable cells daily of a combination of Lactobacillus plantarum HEAL 9 (DSM 15312) and Lactobacillus paracasei 8700:2 (DSM 13434) for 12 weeks, 55% experienced colds compared to 67% of those who received placebo ([Berggren, 2011](#)). The number of days with cold symptoms was also lower (6.2 days vs. 8.6 days for the placebo).

Giving children (aged 3 to 5) in China a combination of Lactobacillus acidophilus NCFM (5 billion cells per day) and Bifidobacterium animalis subsp lactis Bi-007 (5 billion cells per day) versus placebo for 6 months (November to May) was shown to reduce the incidence of fever by 73%, coughing by 62%, runny nose by 59%, and also reduced the duration of these symptoms by 48% ([Leyer, 2009](#)). Lactobacillus acidophilus alone (10 billion cells per day) was also effective but not as effective as the combination product.

### Weight and Fat Loss

In a preliminary study of overweight Japanese adults with large amounts of abdominal fat, giving 100 billion cells of Lactobacillus gasseri SBT2055 (LG2055) in a fermented milk product daily for 12 weeks significantly reduced abdominal visceral fat by 4.6% and abdominal subcutaneous fat by 3.3% at the end of the study. Body mass index was also significantly decreased by 1.5% and waist size decreased by 1.8% at the end of the study ([Kadooka, Eur J Clin Nutr 2010](#)). In a similar study using the same product, but giving lower doses of about 1.4 billion or 16 billion viable cells daily, abdominal visceral fat was significantly reduced by about 8% with both doses after 12-weeks. Body mass index was also reduced by 1.6% and 1.1%, respectively and waist circumference reduced by 1.2% to 1.4% respectively at the end of the study. However, subcutaneous visceral fat was not significantly reduced with these lower doses ([Kadooka, Br J Nutr 2013](#)). In both studies, no significant improvements occurred in the placebo group, which was given regular fermented milk. (Note: The product used in these studies is not currently available in the U.S. Two products in this Review, however, contain L. gasseri — Garden of Life RAW Probiotics Women and Phillips Colon Health, although the strain of L. gasseri may be different from that in the study and the products contain additional organisms.)

A study in Canada found a greater decrease in body weight and fat mass among women taking a probiotic than among those taking placebo during a 12-week diet (500 Calorie reduction in daily intake). Women taking the probiotic lost an

average 9.7 lbs, while those taking the placebo lost just 5.7 lbs. Women taking the probiotic continued to lose more weight (another 1.3 lbs) during a subsequent 12-week period of normal caloric intake, but those taking placebo had little further change in weight. The probiotic provided 162 million cells daily of *Lactobacillus rhamnosus* CGMCC1.3724 (also called LPR) along with 300 mg of a prebiotic mix of oligofructose and inulin. The dose was divided into two capsules -- one taken 30 minutes before breakfast and the other taken 30 minutes before dinner. The study included men, but those taking the probiotic lost no more weight than those who received placebo, with both groups losing 9 to 10 lbs, on average, during the calorie reduction phase and another 2 lbs over the subsequent 12 weeks. The researchers note that men tend to lose weight more easily than women and the findings suggest that this probiotic formulation helps obese women achieve sustainable weight loss ([Sanchez, Br J Nutr 2013](#)). The study was funded by Nestle, which does not yet market this formula in North America.

### Cholesterol-lowering

Some probiotics may be helpful in modestly lowering cholesterol, particularly by lowering LDL cholesterol. A study with *Lactobacillus reuteri* NCIMB 30242 (sold as [Cardioviva](#)) in men and women with high cholesterol showed that those who took a capsule containing 2 billion cells with breakfast and another with dinner for nine weeks had average reductions in both LDL and total cholesterol of about 6% while these levels increased by a few percent among people taking placebo. There was no effect on HDL cholesterol nor triglycerides. ([Jones, Eur J Clin Nutr 2012](#)). A longer study (56 weeks) using a different probiotic, *E. faecium* M-74, found that giving 2 billion cells once daily lead to a 12% reduction in total cholesterol, with a 20% drop in LDL cholesterol -- although total cholesterol and LDL levels also fell in the placebo group by 5.5% and 8.3%, respectively, perhaps due to the fact that participants in both groups began eating healthier during the study ([Hlivak, Bratisl Lek Listy 2005](#)). *Lactobacillus reuteri* NCIMB 30242 may be the safer of the two probiotics as it is generally recognized as safe by the FDA, while *E. faecium* has not gained this status and some strains of this species are human pathogens ([DiRienzo, Nutrition Reviews 2013](#)).

### Anxiety

Chronic gut disorders are associated with higher rates of anxiety and depression. A well-publicized study in mice suggested a possible role for probiotics in reducing anxiety associated with gut inflammation ([Bercik, Neurogastroenterol Motil 2011](#)). Mice in the study had a chemically-induced inflammation of their gut and exhibited anxiety-like behavior. Giving 1 billion cells of *Bifidobacterium longum* NCC3001 for 1 week normalized their behavior. The

probiotic did not reduce inflammation in the gut but appeared to act by reducing the excitability of nerves in the gut which connect, through the vagus nerve, with the central nervous system. Similarly, French researchers evaluated a combination of *Bifidobacterium longum* R0175 and *Lactobacillus helveticus* R0052 (3 billion organisms total — sold in Canada by Jamieson as [Probiotic Sticks](#) with 1 billion cells per stick) taken during or just after breakfast for 30 days in healthy individuals, finding significant improvements in day-to-day depression, anger, anxiety, as well as lower levels of the stress hormone cortisol in those taking the probiotic compared to those taking placebo -- although some improvement also occurred in the placebo group ([Messaoudi, Br J Nutr 2011](#)).

### Periodontitis

A lozenge containing probiotics may be helpful in treating chronic periodontitis - inflammation around the teeth caused by microbial infection, which can result in pockets between the teeth and gums. In a 12-week study in Turkey, 30 otherwise healthy individuals with adult chronic periodontitis dissolved a probiotic lozenge in their mouth twice a day following an initial dental scaling and disinfection with chlorhexidine solution. All patients, including those given placebo, experienced improvements, but those using the probiotic had significantly greater reduction in the depth of pockets around affected teeth and gain in tooth attachment to ligaments in moderate and deep pockets. The probiotic-treated group also had a greater reduction in several parts of the mouth of *Porphyromonas gingivalis*, a bacteria considered a keystone in the onset of chronic periodontitis. The probiotic treatment was most effective in patients with moderate to severe periodontitis. The lozenge contained 100 million cells of each of two strains of *Lactobacillus reuteri* DSM17938 and ATCC PTA5289 ([Prodentis](#) from BioGaia, Sweden, sold in the U.S. and Canada as [GUM PerioBalance](#)) ([Teughels, J Clin Periodont 2013](#)).

### Other conditions

Although the evidence is not clear-cut, probiotics have been studied as a treatment for many other conditions and their symptoms including: lactose intolerance, respiratory and GI problems resulting from cystic fibrosis, HIV-related diarrhea, Crohn's disease, ulcerative colitis, pouchitis, cancer prevention, high blood cholesterol, tuberculosis, eczema, acne, canker sores, dental cavities, milk allergies, hay fever, and the prevention of respiratory infections in children. See [Consumer Tips: What to Consider When Using](#) for dosage information and, for more information, see the article about [Probiotics](#) in the Natural Product Encyclopedia on this website.

Summary of Evidence for Probiotics:



To help you choose an appropriate probiotic, the clinical importance of each type of probiotic is summarized below. In general, Lactobacillus strains have the widest range of applications, while Streptococcus strains have the most limited positive evidence for diarrhea when combined with other probiotics. Examples of products that contain certain probiotic organisms are included in parentheses.