

Probiotics: A Comprehensive Guide



This article examines the various types of Probiotics and their strains, detailing their potential uses as a health supplement. Academic studies also highlight the benefits and possible side effects of probiotics.

Warning: There are many types of probiotics, each with different effects on the body, and little is known about which are best. You may find a particular type of probiotic helps with one problem. This does not mean it will help other issues, or that different types of probiotics will work just as well. There is likely to be a massive difference between the pharmaceutical-grade probiotics that show promise in clinical trials and the yoghurts and supplements sold in shops. If you have an existing health condition or a weakened immune system, you should talk to a doctor before taking any probiotic supplements.

What are Probiotics?

Probiotics are promoted for their health benefits, particularly in restoring the natural balance of bacteria in the gastrointestinal tract, including the intestines and stomach. Probiotics are microorganisms, including live bacteria and yeasts, that are either added to yoghurt or taken as a separate food supplement in liquid, powder, tablet, or capsule form. The companies that sell such products often describe Probiotics as “good” or “friendly” bacteria. Probiotics occur naturally in some foods, including live yoghurt, milk kefir, miso soup, fermented soft cheeses, kimchi, and sauerkraut.

There are more than one type of Probiotics, each with different characteristics and containing various strains of bacteria. The two most commonly used Probiotics are Lactobacillus Acidophilus and Bifidobacterium, with the former recommended for lowering the incidence of antibiotic-

associated diarrhoea, and the latter recommended for IBS sufferers to reduce stool frequency, bloating and cramps.

Probiotics depend on other live bacteria and yeasts, called Prebiotics, to provide the most benefit. Prebiotics are non-digestible plant fibres that the body finds difficult to absorb and act as food for probiotics. Typical Prebiotic foods are garlic, onion, bananas, asparagus, oats, barley, leeks and those containing resistant starch. So, Probiotics and Prebiotics work together to provide a healthy digestive system.



The Different Types of Probiotics

There are several types of probiotic organisms, each of which can be used to address different conditions in various parts of the body. The two most common probiotic groups are Lactobacillus and Bifidobacterium, and each has different strains. Other probiotic types include Bacillus, Streptococcus and Saccharomyces Boulardii (also called Saccharomyces Cerevisiae). Saccharomyces Boulardii, which often goes under the brand name of Florastor, is a strain of Baker's Yeast.

The table below outlines the various types of Probiotic strains and their recommended uses. Lactobacillus, Bifidobacterium, Bacillus, and Streptococcus strains have been used to treat a variety of ailments; the most common are listed in the table.

Probiotic Type	Strain	Use to Treat/Improve
Lactobacillus	Acidophilus	Digestion, Diarrhoea, IBS, Crohn's Disease, Bacterial Dysbiosis
	Fermented	Digestion, Immune Response, Liver Health, Cholesterol Levels
	Plantarum	Digestion, Immune Response
	Rhamnosos	Diarrhoea, Vaginal Health, Crohn's Disease, Lactose Intolerance
	Salivarius	Oral Health, Mastitis, Colitis, IBS, E Coli, Salmonella
	Paracasei	Liver Health
	Gasseri	Diarrhoea, Vaginal Health, Obesity
	Reuteri	Digestion, Oral Health, Immune Response
Bifidobacterium	Bifidum	Digestion, Diarrhoea, IBS, Lung Health
	Longum	Digestion, Immune Response
	Breve	Diarrhoea, Allergies. Skin, Obesity
	Infantis	Diarrhoea, IBS, Colitis, Psoriasis
Bacillus	Coagulans	Diabetes, IBS, Arthritis, Vaginal Health
	Subtilis	Digestion, Obesity, Diabetes
Streptococcus	Salivarius K12	Oral Health, Immune Response
	Salivarius M18	Oral Health
	Thermophilus	Skin, Lactose Intolerance, Diarrhoea, Oral Health
Baker's Yeast (not a Probiotic)	Saccharomyces Boulardii	Diarrhoea, IBS, Urinary Tract Infections, Acne

The table also shows typical uses and treatments for each type of Probiotic. This is not an exhaustive list, as some people have used these Probiotics for the treatment and prevention of a whole range of other conditions, which are detailed in this section.

Lactobacillus is a type of bacteria that generally lives in the human digestive, urinary and genital systems, although it is not disease-causing. As a Probiotic, it is mainly used for the treatment and prevention of diarrhoea, including infectious types such as rotavirus diarrhoea in young children and traveller's diarrhoea. Lactobacillus is also used to prevent and treat diarrhoea caused by using antibiotics.

Some people have also used Lactobacillus for the treatment of digestive problems, Crohn's disease, irritable bowel syndrome (IBS), colon inflammation, colic in babies, and a severe disease called necrotising enterocolitis, which affects the intestines of premature babies. Other uses have included the treatment of Helicobacter Pylori, which causes most stomach and duodenal ulcers. In addition, Lactobacillus has been used to treat urinary tract infections (UTIs), infections in people on ventilators, vaginal yeast infections, respiratory infections in children attending daycare centres, the prevention of the common cold in adults, and to boost the immune system. Other uses include treatment for Lyme disease, lactose intolerance, high cholesterol, and hives, allergic dermatitis, eczema, acne, canker sores, and fever blisters.

Bifidobacteria, as the name suggests, are a type of bacteria that usually exist in people's intestines. However, this type of bacteria, lactic acid bacteria, can be produced externally and used as a Probiotic medication. It is commonly used for the treatment of IBS, constipation, diarrhoea (including traveller's diarrhoea and diarrhoea in babies) and for the prevention of colds and flu. Other uses include the treatment of Helicobacter Pylori, which causes most stomach and duodenal ulcers, as well as airway infections such as the common cold in adults and children, and ulcerative colitis of the bowel. It is also used to minimise the death of good bacteria when patients are taking antibiotics.

Bacillus Coagulans is a type of bacteria that produces lactic acid and is often misclassified as Lactobacillus, although it is used similarly to Lactobacillus and other probiotics. People use Bacillus coagulans to treat diarrhoea, including rotavirus diarrhoea in young children, traveller's diarrhoea, and diarrhoea caused by antibiotics. Bacillus coagulans has also been used by people to treat IBS, general digestion problems, Crohn's disease, ulcerative colitis, Clostridium Difficile Colitis and Helicobacter Pylori. Other uses by people include preventing cancer and cancer-causing agents, preventing respiratory infections, and supporting immune system health.

Bacillus Subtilis is a spore-creating bacterium that is usually found in the soil and the gastrointestinal tracts of sheep, cattle, goats and human beings. It has also been used as an alternative to antibiotics for poultry and livestock. In humans, it supports digestion, enzyme production, and helps maintain a healthy gastrointestinal tract. Additionally, it helps decrease weight gain and protect against the development of certain diabetic foot ulcers.

Streptococcus Salivarius is a nonpathogenic bacterial species of the streptococci found in the human oral cavity and gastrointestinal tract. It has anti-inflammatory properties and is used to improve oral health and maintain a healthy immune system.

Streptococcus Thermophilus is a thermophilic lactic acid bacterium used in the manufacture of dairy products. People use it to help alleviate lactose intolerance, improve oral health, treat chronic gastritis, and relieve diarrhoea.

Saccharomyces Boulardii is a yeast, which is a type of fungus and prevents the recurrence of diarrhoea caused by the bacteria Clostridium Difficile. Some people also use Saccharomyces Boulardii for general digestion problems, Crohn's disease, IBS, ulcerative colitis and Lyme disease. Other uses include lactose intolerance, urinary tract infections, vaginal yeast infections, high cholesterol levels, hives, and teenage acne, as well as the treatment of eczema, acne, canker sores, and fever blisters.

In the next section, details of clinical trials are provided to demonstrate the effectiveness of each Probiotic in treating and preventing certain conditions. In addition, the following section provides details on side effects and warnings associated with taking these Probiotics.

Test Results and Side Effects

Many laboratories have tested probiotics to verify suppliers' and manufacturers' claims and assess whether product labelling is correct. In addition, tests have been conducted to determine the potential side effects of different probiotics, which are listed in this section.

In 2007, a Scientific American report by Ferris Jabr, entitled "[Do Probiotics Really Work?](#)", concluded that although certain probiotics help treat some gut disorders, Probiotics have no known benefits for **healthy** people. However, the report went on to state that several combined analyses of dozens of studies have concluded that Probiotics may help prevent some common side effects of antibiotic treatment.

A 2014 review by an independent network of experts working for [Cochrane](#) found that Probiotics can be helpful in a hospital's neonatal intensive care unit, significantly reducing the likelihood that premature babies will develop Necrotising Enterocolitis. Researchers estimate that 12% of premature babies, weighing less than 3.3 pounds, will develop Necrotising Enterocolitis and that 30% of them will not survive. Probiotics likely prevent the disorder by increasing the number of beneficial bacteria, which may help deter harmful bacteria.

In 2006, [Jens Walter](#) of the University of Alberta and his colleagues published a study to determine what it would take for the bacteria in a Probiotic to successfully colonise the intestines of 23 volunteers. They chose a strain of Bifidobacterium Longum, and the volunteers consumed either a drink containing 10 billion live Bifidobacterium Longum bacteria or a placebo. Periodic faecal samples revealed higher-than-typical levels of Bifidobacterium Longum in participants who did not consume the placebo, and the study concluded that their gut ecosystems had a vacancy that the Probiotic filled. So, if a doctor knows that an individual with severe diarrhoea has an undersized population of a particular Probiotic, then prescribing the missing strain should increase the chance of a successful treatment.

A report in the Saudi Pharmaceutical Journal entitled "[Role of Probiotics in health improvement, infection control and disease treatment and management](#)", by contrast to other learned reports, concluded there were some health improvement benefits of Probiotics, as follows:

1. Probiotics are helpful and friendly microbes.
2. They can compete with the harmful microbes and colonise our digestive system.
3. They can ferment our food into simpler by-products and could promote our health through many different mechanisms.
4. Their amount could be deteriorated due to many factors, such as incorrect diet, alcohol, age and so on. This is why they should be taken through our regular diet.
5. In particular cases, such as after antibiotic treatments, where they are expected to be affected severely, they should be taken orally in considerable amounts or with food.
6. Probiotics promote health while they:
 - Remove the side effects of the pathogens or the harmful microbes.
 - Supply the body with valuable by-products.
 - Reduce the jobs of our digestive system.
 - Reduce the effect of the first attack of harmful compounds, instead of our cells, by their biofilm, which protects our digestive system.
 - Reduce the amount of food needed by our bodies due to the correct digestion and metabolism of any amount of food.
 - Probiotics, in some cases, could complement the deficiency in our genetic materials by helping us to borrow the products of their genes (such as in the case of the lactose fermentation deficiency).

The report also produced a list of Probiotic strains that can be used to treat certain diseases. The table is as follows:

Disease Name	Strain
Eczema	Escherichia coli; Bifidobacterium bifidum; Bifidobacterium lactis; Lactococcus lactis
Food allergies	Escherichia coli
Immunity	Bacillus circulans PB7; Lactobacillus plantarum DSMZ 12028
Antibiotic effect removal	Enterococcus mundtii ST4SA Lactobacillus plantarum 423; Lactobacillus brevis KB290; Lactobacillus strains; Bifidobacterium strains
Gastroenteritis Therapeutics	Lactobacillus casei
Intestinal hyperpermeability	Lactobacillus plantarum species 299 (LP299)
Vaginal candidiasis (thrush)	Lactobacillus rhamnosus GR-1 Lactobacillus reuteri RC-14
Urinary tract infection	Lactobacillus rhamnosus GR-1 Lactobacillus reuteri RC-14
Lactose intolerance	Lactobacillus acidophilus
Non-steroidal anti-inflammatory drug	Escherichia coli strain Nissle 1917
Intestinal dysbiosis	Lactobacillus johnsonii La1; Lactobacillus strain; Lactobacillus GG
Irritable bowel syndrome	Bifidobacterium infantis 35624; Escherichia coli DSM17252; Bifidobacterium infantis 35624
Traveller's diarrhoea	Lactobacillus GG; Lactobacillus plantarum
Radiation-induced diarrhoea	Lactobacillus casei DN-114 001
Crohn's disease	Escherichia coli strain Nissle 1917
Prevention of colon cancer	Enterococcus faecium M-74; lactic acid bacteria
Ulcerative colitis	Lactobacillus acidophilus; Escherichia coli Nissle 1917; Bifidobacterium
Peptic ulcer disease	Lactobacillus acidophilus
Prevention of atopy	Lactobacillus rhamnosus GG
Hypercholesterolemia and cardiovascular diseases	Enterococcus faecium M-74; Lactobacillus plantarum Propionibacterium freudenreichii; Lactobacillus plantarum PH04

In 2003, an in-depth study published in the Applied and Environmental Microbiology Journal by R. Temmerman, I. Scheirlinck, G. Huys, and J. Swings, entitled, "[Culture-Independent Analysis of Probiotic Products by Denaturing Gradient Gel Electrophoresis](#)" tested 10 Probiotic yoghurt products, including Actimel and Activa, and found that the quality of many of these probiotic products were misleading in terms of their contents and label information and six products were not found to contain all the claimed species shown on the label.

In 2013, an investigation by Margaret A Brinich, Mary Beth Mercer and Richard R Sharp, published by BMC Gastroenterology, entitled "An Analysis of Online Messages about Probiotics", examined a sample of 71 websites presenting Probiotic information. The study found that on commercial websites, descriptions of the benefits far outnumbered descriptions of the risks associated with taking the Probiotic. In contrast, on non-commercial websites, more risks were included.

Regarding the side effects of Probiotics, it depends significantly on the individual's state of health. The National Center for Complementary and Integrative Health (NCCIH) conducted a study that showed a particular type of Lactobacillus to be safe in healthy adults aged 65 and older. However, the study concluded that this does not necessarily mean that all Probiotics would be safe for all people in this age group. There are no studies on the side effects of every Probiotic strain, so if you are taking a particular one, any side effects should be reported to a medical practitioner.

For those who are generally healthy, Probiotics do have a good safety record. Side effects, if they occur at all, are usually mild and consist only of digestive symptoms such as flatulence. On the other hand, there have been reports linking Probiotics to severe side effects, such as dangerous infections in people with serious underlying medical problems. The people who are most at risk of severe side effects include critically ill patients, those who have had surgery, very sick babies, and people with weakened immune systems.

Several studies have concluded that, even for healthy individuals, there is uncertainty about the side effects of taking Probiotics. Because many research studies on Probiotics have not closely examined the side effects of all strains, there is not enough information right now to answer many side-effect questions. Most knowledge of side effects comes from studies of Lactobacillus and Bifidobacterium, though less is known about other Probiotics. Information on the long-term side effects of Probiotics is limited, and side effects may differ from one type of Probiotic to another.

However, some of the reported side effects are listed in the table below. This shows typical side effects that may occur and is not particular to any type or strain of probiotics. The information in this table is based on an evidence-based [study](#) by Erica Julson and her colleagues in 2017, which investigated the side effects of probiotics and highlighted five possible side effects. The conclusions are as follows:

Side Effect	Description
Unpleasant Digestive Symptoms	The most commonly reported side effect of bacteria-based probiotic supplements is a temporary increase in flatulence and bloating. Starting with a smaller dose may prevent this.
Headaches due to Amines in Probiotic-Rich Foods	Foods such as kimchi, yoghurt and sauerkraut contain Amines. Amines can excite the central nervous system, increase or decrease blood flow and may trigger headaches or migraines in some people.
Some Probiotic Strains can increase Histamine levels in the Digestive Tract	When histamine levels rise, blood vessels dilate, allowing more blood to flow to the affected area. The vessels also become more permeable, allowing immune cells to enter the relevant tissue and combat pathogens easily. This process can cause redness and swelling in the affected area and may also trigger allergy symptoms, such as itching, watery eyes, a runny nose, or trouble breathing. Individuals with histamine intolerance should avoid such Probiotic strains. Some histamine-producing probiotic strains include <i>Lactobacillus buchneri</i> , <i>Lactobacillus helveticus</i> , <i>Lactobacillus hilgardii</i> and <i>Streptococcus thermophilus</i> .
Some Probiotic Ingredients may cause Adverse Reactions	Such individuals should read the labels of Probiotic supplements carefully, as they may contain ingredients to which they could react. Ingredients could include yeast, milk, sugar, and lactose. Some Probiotic supplements also contain Prebiotics, and this can cause flatulence and bloating in some individuals.
The increase in Infection risk	In rare cases, bacteria or yeasts in probiotics can enter the bloodstream and cause infections in susceptible individuals. It is estimated that only about 1 in 1,000,000 people who take Probiotics containing <i>Lactobacillus</i> bacteria will develop an infection. When infections do occur, they typically respond well to traditional antibiotics or antifungals. However, in rare cases, deaths have occurred. Research also suggests that people with severe acute pancreatitis should not take probiotics, as this may also increase the risk of death.

Conclusion

Research into the effectiveness of Probiotics and their side effects yields mixed results. However, if an individual is completely healthy with no allergies, there is no benefit to taking Probiotics. Probiotics are living microorganisms that provide health benefits for specific conditions. Probiotics are generally safe for most people, but side effects can occur in some individuals. The most common side effects are a temporary increase in flatulence, bloating, constipation, and thirst. Some people may react to the ingredients in Probiotics; if this occurs, the supplement should be discontinued.

Overall, probiotics are a beneficial addition to most individuals' diets or supplement regimens, with relatively few and unlikely side effects. Care should be taken when reading labels and claims for commercially advertised supplements, as some products may not list all ingredients and their benefits may be exaggerated. At the same time, some possible side effects may not be disclosed.