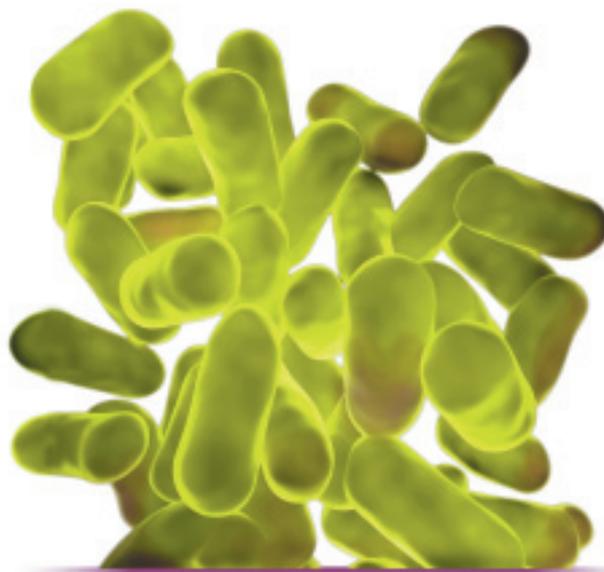


# A Guide to the Use of Probiotics



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**D**espite the resurgence of probiotics in the medical field, their widespread use seems to have reached a limited audience. Many practitioners are unaware of the “best-of-breed” probiotics, and much of the research does not appear on physicians’ radar screens. As a result, many physicians may be under-using these potentially beneficial substances in their daily practices. This article considers the use of probiotics in daily practice, and highlights the use of probiotics in the treatment of patients with postinfectious irritable bowel syndrome.

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The Table classifies the “best-of-breed” probiotics based on name, composition, and dosing. In addition to dosing information, the Table lists the probiotics’ manufacturers, providing all the information required for ordering and purchasing. This Table may be used by treating physicians and their patients as a guide for treatment with probiotics, simplifying the accessibility of these seemingly elusive substances.

## **Characteristics of Probiotics**

Probiotics have been used for many years to aid in restoring and maintaining a healthful internal balance of bacteria—a balance that is essential for maintaining good health. When choosing a probiotic for treatment, the physician should consider the qualities and characteristics that are essential for establishing the activity and survival of these beneficial organisms.

**Table. Classification of Marketed Probiotics**

Name	Distributor*	Strain	Adult Dosage†
Align‡	Procter & Gamble (Cincinnati, Ohio) (800) 208-0112	<i>Bifidobacterium infantis</i> 35624	1 capsule per day (1 billion live bacteria per capsule)
CP-1	Custom Probiotics, Inc. (Glendale, Calif.) (800) 219-8405	<i>Lactobacillus acidophilus</i> ; <i>Lactobacillus plantarum</i> ; <i>Lactobacillus rhamnosus</i> ; <i>Bifidobacterium bifidum</i> ; <i>Bifidobacterium longum</i>	1-2 capsules per day (35 billion microorganisms per capsule)
Culturelle	Amerifit Nutrition, Inc. (Bloomfield, Conn.) (800) 722-3476	<i>Lactobacillus GG</i>	1-2 capsules per day (10 billion live active cells per capsule)
Flora Q	Kenwood Therapeutics (Fairfield, N.J.) (800) 929-9300	<i>Bifidobacterium</i> ; <i>Lactobacillus acidophilus</i> ; <i>Lactobacillus paracasei</i> ; <i>Streptococcus thermophilus</i>	1 capsule per day (no fewer than 4 billion colony-forming units per capsule)
Florastor	Biocodex, Inc. (Creswell, Ore.) (877) 356-7787	<i>Saccharomyces boulardii</i>	1 capsule, bid (5 billion live cells per 250-mg capsule)
HLC High Potency Capsules	Emerson Ecologics, Inc. (Bedford, N.H.) (800) 654-4432	<i>Lactobacillus acidophilus</i> (CUL 21); <i>Lactobacillus acidophilus</i> (CUL 60); <i>Bifidobacterium bifidum</i> (CUL 20); <i>Bifidobacterium lactis</i> (CUL 34)	1-2 capsules per day, with meals (8 billion viable cells per capsule)
Lacidofil DF	Xymogen Inc., Exclusive Professional Formulas (Orlando, Fla.) (800) 647-6100	<i>Bifidobacterium longum</i> Rosell-175; <i>Lactobacillus acidophilus</i> Rosell-52; <i>Lactobacillus rhamnosus</i> Rosell-11	1-2 capsules per day, before or during meals (2 billion live organisms per capsule)
Ultra Flora Plus DF	Metagenics (San Clemente, Calif./Gig Harbor, Wash.) (800) 692-9400	<i>Bifidobacterium lactis</i> ; <i>Lactobacillus acidophilus</i> NCFM strain	1-2 capsules per day (no fewer than 15 billion combined live organisms per capsule)
VSL#3	Sigma-Tau Pharmaceuticals, Inc. (Gaithersburg, Md.) (866) 438-8753	<i>Bifidobacterium breve</i> ; <i>Bifidobacterium infantis</i> ; <i>Bifidobacterium longum</i> ; <i>Lactobacillus acidophilus</i> ; <i>Lactobacillus bulgaricus</i> ; <i>Lactobacillus casei</i> ; <i>Lactobacillus plantarum</i> ; <i>Streptococcus thermophilus</i>	0.5-8 packets per day (450 billion live lactic acid bacteria per packet)

\* Some of these distributors require physicians to register in order to provide a discount to their patients.

† For maximal benefit, treatment should consist of this dosage for 5 to 8 weeks, followed by half-dosing.

‡ Pending independent analysis

**bid**, twice daily; **DF**, dairy free; **NCFM**, North Carolina Food Microbiology

Characteristics that allow probiotics to act appropriately at the cellular intestinal level include the following:

- Secretion of toxins that inhibit pathogenic bacteria;
- Production of short-chain fatty acids that serve as food for colonocytes and inhibit apoptosis;
- Production of B vitamins;
- Production of lactase, which aids in digestion (Patients with lactose intolerance frequently note a relief of gastrointestinal symptoms in response to treatment with probiotics);
- Production of virus-specific neutralizing antibodies; and

- Upregulation of immunoglobulin A, tumor necrosis factor- $\alpha$ , interleukin (IL)-6, and IL-10.

When a probiotic is selected for treatment, the following technical criteria should be considered:

- Maintenance of verified viability;
- Maintenance of colonization properties throughout processing and storage of the probiotic;
- Good storage stability;
- Acid/bile resistance;
- Accurate strain identification;
- Dose-response data for required effects; and
- Origin (should be of human origin).

## Uses for Probiotics

Probiotic therapy should be considered as adjunctive therapy for many cases presented in daily clinical practice, including cases of:

- Irritable bowel syndrome (IBS);
- Postinfectious IBS (PI-IBS);
- Inflammatory bowel disease;
- *Clostridium difficile*-associated diarrhea;
- Viral or other infectious gastroenteritis with prolonged or unresolved diarrhea;
- Dairy intolerance;
- Antibiotic-associated diarrhea (as treatment or as prophylaxis);
- Travelers' diarrhea;
- Sepsis in hospitalized patients on respirators; and
- Prolonged NPO (nothing by mouth) status in hospitalized patients in whom translocation of enteric pathogens due to compromised intestinal permeability and integrity are a concern.

### POST-INFECTIOUS IRRITABLE BOWEL SYNDROME

Studies have demonstrated a link between gastroenteritis and the development of IBS. Although the role of infection and inflammation in IBS pathogenesis is not well understood, studies have shown increased numbers of enterochromaffin (EC) cells, CD3 lymphocytes, and mast cells within the colonic muscle wall that release proinflammatory substances. Expression of interleukin-1 beta mRNA in the terminal ileum and the rectosigmoid mucosa have been shown to be elevated in patients with IBS and PI-IBS. Increased numbers of inflammatory cells in the intestinal nerve endings appear to be a common histopathologic finding. The presence of low-grade inflammation in intestinal biopsies, combined with markers of intestinal inflammation such as fecal calprotectin, indicate a strong possibility that persisting inflammation after acute gastroenteritis may be important in the pathogenesis of PI-IBS.

Patients who develop PI-IBS have been shown to be unable to downregulate the inflammatory stimulus of gastrointestinal infection effectively. This deficiency could be explained by a genetic predisposition, or it may result from dysbiosis of the gut flora prior to infection. Low grade inflammation and activation of mast cells in proximity to nerves in the colonic mucosa may participate in the frequency and severity of perceived abdominal pain in patients with PI-IBS. The toxigenicity of the infectious organism and the duration of diarrhea during the initial illness have also been shown to be risk factors for PI-IBS. In addition, patients who develop PI-IBS have a higher frequency of psychological disorders and stressful events prior to the gastroenteritis episode. Hypochondriasis and adverse life events increase the risk for PI-IBS as well.

Probiotic-induced modification of colonic flora has demonstrated a therapeutic effect in some patients with PI-IBS. Probiotics have been shown to block the invasion of human intestinal cells by enteroinvasive bacteria. They can also modulate the intestinal immune response, and protect and stabilize the mucosal barrier. Probiotic supple-

mentation has been recommended as a prophylactic approach in patients with proinflammatory cytokine profiles. In theory, increased levels of probiotics may induce a "barrier influence" against common pathogens. In addition, other mechanisms—such as the production of anti-inflammatory cytokines—may contribute to efficacy.

Probiotics vary in efficacy, and the same results may not be achieved with all probiotic species. Emerging data suggest that the beneficial effects of probiotics may be strain-dependent.

Studies to date support the use of probiotics for the treatment of patients with PI-IBS, as this intervention may decrease the severity of symptoms and duration of the illness. Prophylactic probiotic therapy should be considered as a first step in the prevention of infectious gastroenteritis and traveler's diarrhea in high risk populations. Best of breed probiotics should be considered for patients with IBS and PI-IBS when appropriate.

## Conclusion

The etiology of a subset of patients with IBS may someday be defined as a disturbance of the microbial gut flora causing intestinal dysbiosis and setting the stage for inflammation that may yield a multitude of gastrointestinal symptoms. In the future, treatment for IBS may include specific antibiotics supplemented with potent probiotics that will be species-specific and genetically tailored for patients based on their genetic profile, presenting symptoms, and underlying diagnoses.

As we continue to view current and anticipate future studies on probiotics that will provide a better understanding of the mechanisms of action of these agents at the molecular and cellular levels, the role of probiotics in the defense of gut infection and inflammation will be elucidated. In cases where *primum non nocere* is not compromised, it would behoove physicians to offer probiotic therapy to their patients.

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**AUTHOR DISCLOSURE**—Dr. Faber has received honoraria from Metagenics and Xymogen.

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# Patient Guide to PROBIOTICS



**P**robiotics are live microorganisms that balance intestinal bacteria and promote gastrointestinal health. They not only aid in digestion of food but are also believed to prevent harmful microorganisms from flourishing. Probiotics have been used for many years to restore bacterial imbalances resulting from antibiotic use, diarrhea, and gastroenteritis, among other causes. Recent research has focused on probiotic therapy as a means of regulating bacteria levels in the intestine to avoid possible health problems in the future. It has also been suggested that certain probiotics may have anticarcinogenic effects, as well as other health benefits. Probiotics can often be found as nutritional supplements and in foods such as yogurt.

## Q & A

### Probiotics may be considered in cases of

- ❖ Irritable bowel syndrome (IBS)
- ❖ Inflammatory bowel disease (IBD)
- ❖ *Clostridium difficile*-associated diarrhea
- ❖ Viral or other infectious forms of gastroenteritis with prolonged diarrhea
- ❖ Antibiotic-associated diarrhea
- ❖ Traveler's diarrhea
- ❖ Lactose intolerance

### Why has probiotic therapy become so popular?

It is believed that modern diets eliminate naturally occurring microorganisms, via processing, that our bodies need to digest food, absorb vitamins and minerals, and keep bad bacteria at bay. To compensate for the lack of probiotics in refined foods, many individuals have turned to vitamin supplements to balance intestinal microflora.

### Who should take probiotics?

Individuals suffering from irritable bowel disease, Crohn's disease, or general gastrointestinal problems may obtain relief through probiotic supplementation. Probiotics may also be of use in treating common female ailments resulting from microflora imbalance, such as yeast and urinary tract infections. Current studies are investigating which probiotic strains are appropriate for particular conditions.

### How do I take probiotics?

You may frequently hear the terms "probiotic therapy" and "probiotic treatment," which imply that probiotics are "dosed" or "prescribed" as medicine. Although your doctor or nutritionist may recommend probiotic bacteria for a specific condition, there are many individuals who simply supplement with microorganisms 2 or 3 times per week to promote intestinal health.

## RESOURCES

National Center for Complementary and Alternative Medicine, National Institutes of Health  
[www.nccam.nih.gov/health/probiotics](http://www.nccam.nih.gov/health/probiotics)

Mayo Clinic  
[www.mayoclinic.com/health/probiotics/AN00389](http://www.mayoclinic.com/health/probiotics/AN00389)

PDR Health  
[www.pdrhealth.com/drug\\_info/nmdrugprofiles/nutsupdrugs/pro\\_0034.shtml](http://www.pdrhealth.com/drug_info/nmdrugprofiles/nutsupdrugs/pro_0034.shtml)

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