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Probiotics

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- Understand why and when to incorporate probiotics into your diet
- Apply probiotics to health issues and digestive problems
- Choose probiotic-rich foods and supplements

Shekhar K. Challa, MD
Board Certified Gastroenterologist

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Probiotics

FOR

DUMMIES®

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Probiotics FOR DUMMIES®

SPECIAL EDITION

by Shekhar K. Challa, MD

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Introduction

Most people have experienced occasional digestive trouble — diarrhea, constipation, and so on. Some 15–30 million Americans suffer from *irritable bowel syndrome* (see Chapter 2), and many millions more are affected by a range of digestive disorders. For many years, such people either got by with no treatment at all or used prescription and over-the-counter medications that, too often, either didn't work or didn't work well enough.

Fortunately, researchers now understand much more about how your body's digestive system actually works. As it turns out, your intestines are populated by up to 1,000 different kinds of bacteria — some of which cause problems, but most of which are "good" bacteria that keep the bad guys under control and perform vital functions for your immune system and overall health.

As this body of knowledge has grown, so have efforts to create products that help your body keep that critical balance of good bacteria alive and thriving. *Probiotics* are good bacteria, and they're showing up more and more frequently in foods and in dietary supplements.

About This Book

This book is intended to be a handy primer on how probiotics work, why they help keep you healthy, and how they can affect certain health problems. One chapter even covers the most recent findings on the role probiotics may play in preventing or treating diseases like colon cancer and cardiovascular disease.

Although various societies throughout history have used probiotics in one form or another (see Chapter 1), their use in the United States is relatively recent, and reliable, easy-to-understand information about probiotics can be hard to come by.

This book is designed to help fill the need for good information about probiotics and to answer basic questions about how they may benefit you.

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How to Use This Book

The information in this book is split into chapters so you can easily find the stuff you want. The chapter titles tell you which topics are covered (see the Table of Contents for more details):

- Chapter 1: Eating It Up: Discovering Probiotics
- Chapter 2: Checking Out Probiotics for Digestive Health
- Chapter 3: Applying Probiotics to Other Health Issues
- Chapter 4: Adding Probiotics to Your Life
- Chapter 5: Exploring the Promise of Probiotics in Preventing Disease
- Chapter 6: Ten (or So) Things to Look For in a "Good" Probiotic

Technical terms are in *italics*, with a plain-English definition or explanation nearby.

Icons Used in This Book

Occasionally throughout the text, you see little icons in the left-hand margin. Here's what these symbols mean:

This symbol alerts you to information that's important to keep in mind as you explore using probiotics.

The bull's-eye icon indicates helpful information, such as how to choose probiotics-rich foods or where to find probiotic supplements.

Okay, nothing is *really* going to explode if you don't heed the information next to this little bomb. But it does tell you that you should be aware of potential problems.

Technical stuff is information that's interesting but not essential; you can safely skip over text marked with this icon without missing anything important.

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Chapter 1

Eating It Up: Discovering Probiotics

In This Chapter

- Getting an inside look at your digestive system
- Seeing how bacteria live and work in your gut
- Exploring the broad benefits of probiotics

The word *bacteria* is enough to send many people scrambling for anti-bacterial hand soap. But bacteria have gotten a bad rap. In fact, good bacteria function throughout your body to keep you healthy. Getting these "good guys" out of whack can make you sick.

Good bacteria can help you digest food, and lots of it is always present in your body. Researchers at the National Human Genome Research project found that each person hosts an average of 1,000 different types of bacteria — just on the *skin*. Clearly, if all bacteria were bad, you'd be losing the battle to stay healthy. Good bacteria even help fight off some of the bad bacteria that cause illness or disease.

One key to bacteria's role in your body is maintaining balance, or keeping the good bacteria at a healthy level. In this chapter, we explore how your digestive system works and how good bacteria help keep you fit and feeling good.

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Seeing How Your Digestive System Works

The digestive process starts when you put a bite of food in your mouth. Your saliva immediately goes to work breaking down that tasty morsel into elements your body can use. Your mouth is also loaded with bacteria, mostly the harmless kind. Some bacteria are swallowed and killed by stomach acids, but others may proliferate and cause problems like tooth decay and gum disease.

Whether you're noshing on a steak, an apple, or a slice of pizza, all the food you eat follows the same path through your digestive system, or *gastrointestinal tract* (often called the *GI tract):* mouth, throat (*pharynx)*, esophagus, stomach, small intestine, and large intestine (or *colon*, which includes the rectum). Figure 1-1 shows the human digestive tract.

Your GI tract performs two crucial functions:

- Breaking down food to provide nutrients for the body
- Preventing harmful substances from being absorbed

When you swallow, the food moves through your digestive system by a process called *peristalsis*. As food comes in contact with the GI tract, muscles contract and propel the food forward, sort of like a wave in the ocean. The esophagus — or food pipe — transports food from the throat to the stomach.

When that chocolate bar or piece of steak enters your stomach, hydrochloric acid and digestive enzymes break it into small particles. *Parietal cells*, located in the lining of your stomach, react to the presence of food and secrete acid to break it down. (Your stomach produces an average of two liters of acid every day.)

After the food is pulverized in the stomach, it's pushed into the small intestine, which is 20 feet long. The small intestine digests food particles, extracting nutrients. Much of what remains after this process is waste from the body's perspective (bacteria are still feeding on the material and even in the colon produce compounds required by the cells lining the colon), and it enters the colon (the 6-foot large intestine). Water from this waste is absorbed, and the remainder, the fecal matter, is eliminated by bowel movements through the rectum and anus.

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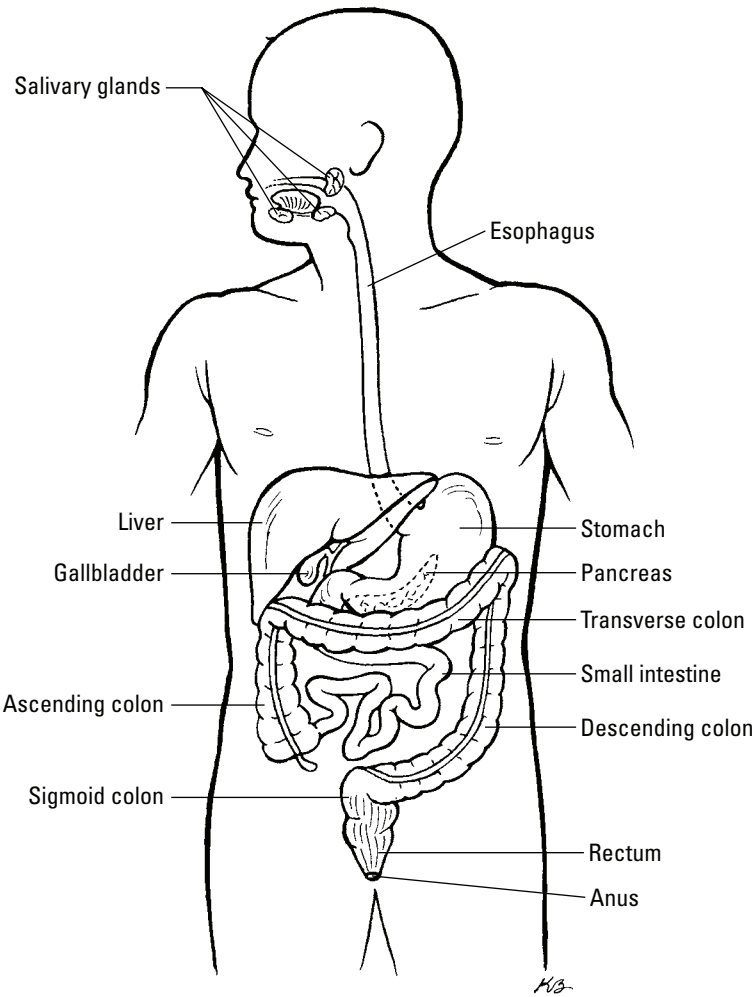

Figure 1-1: Food travels through the digestive system, from mouth to colon.

The colon is lined with the *mucosal barrier*, also called the *epithelial barrier*. A healthy mucosal barrier prevents the body from absorbing harmful organisms and toxins. But if the barrier is compromised — for instance, overusing antibiotics can wear away spots in the barrier — those weak spots can allow some pretty nasty stuff to get into your bloodstream and wreak all kinds of havoc on your health.

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Your overall health depends on the healthy functioning of your digestive system. Not only does it pull nutrients from food to nourish your body, it also helps protect you against disease. In the following sections, we look at the major role bacteria play in both of these essential functions.

Looking at bacteria's role

Bacteria are single-celled microorganisms found everywhere on Earth — in water, soil, plants, and in most parts of your body. In fact, bacteria outnumber the actual cells in your body by about 10 to 1. Your skin and digestive system alone host about 2,000 different kinds of bacteria.

There are fewer bacteria in the stomach than in other parts of the digestive system because the acidic environment kills most bacteria. That makes delivering probiotics particularly challenging — you have to ensure that those good bacteria can survive in the stomach's unfriendly environment. (See Chapter 4 for more on protecting probiotics from stomach acid.)

These organisms acquired their bad reputation in the 1800s, when Louis Pasteur, the father of microbiology, showed that bacterial growth caused spoilage of foods, including milk and beer. He invented the process of heating milk to kill bacteria and mold, now called *pasteurization*. Pasteur proposed that bacteria also cause disease in people, which launched a field that today does much to keep you healthy.

Distinguishing between good and bad bacteria

Not all bacteria are bad. In fact, scientists now know that even the "bad" bacteria in your body don't cause problems as long as your system has enough good bacteria to keep them in check. When you're healthy and have the proper bacterial balance in your body, the ratio of good to bad is about 9 to 1. See Table 1-1 for a list of some good and bad bacteria.

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Table 1-1 Bacteria: The Good and the Bad

Good bacteria	*Bad bacteria*
Lactobacillus	*Salmonella*
Bifidobacteria	*Shigella*
	E. coli
	Clostridium difficile

In addition to bacteria, gut microbiota may include fungi such as candida, saccharomyces, and aspergillus.

Years ago, scientists believed that humans and the bacteria in their bodies had a *commensal* relationship — meaning that they existed together without harming each other. Advances in medicine have helped to clarify that this relationship is *mutualistic*, or beneficial to both you and the bacteria.

The bacteria that populate your GI tract are known as *gut microbiota* or *gut flora*. Gut flora are unique to every individual — almost like fingerprints — beginning at birth and evolving through your life. The GI tract of a human fetus is *sterile,* or completely free of bacteria and fungi. During birth, babies swallow the bacteria present in the birth canal, and within days these bacteria colonize the newborn's intestine. (Babies born via C-section have delayed colonization and may acquire more organisms from the environment, rather than the mother's birth canal, compared to vaginally born infants.)

After the flora fingerprint is established, the bacteria in your body are recognized as "normal" throughout your life. Essentially, these bacteria are your colonic warriors: They recognize each other and work to prevent foreign invasion.

Most bacteria in the digestive system live in the colon because many can't survive in the stomach, and the continual contractions in the small intestine tend to keep most gut flora out. The walls of your colon have billions of *adherence sites*

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where the various bacteria cling, and the friendly bacteria essentially practice population control over bad bacteria by crowding them out of these sites.

Understanding gut flora's nutritional and immune functions

Gut flora play a key role in nutrition and your immune system. Without these tiny helpers, your body wouldn't be able to absorb vital nutrients or carry out its regular maintenance functions. And when your body is under attack from toxins, harmful organisms, or infection, gut flora are like the U.S. Marines — first into the fray.

Gut flora's nutritional functions include

- Producing digestive enzymes that break down food into nutrients the body can use.
- Combining various compounds to generate essential vitamins (a process called *synthesizing)* such as thiamine, folic acid, and vitamin K, among others.
- Helping the body absorb nutrients like calcium, iron, and magnesium.

Gut flora also help keep the lining of your GI tract intact and healthy. The cells that line your colon need energy to regenerate themselves; gut flora convert unabsorbed sugars into specific types of fatty acids that your cells use for energy.

Gut flora also help support the immune system. In fact, 70–90 percent of your immune system is located in your GI tract, where gut flora work in several ways:

- Producing enzymes and proteins that can kill or inhibit harmful bacteria
- Crowding out the "bad" bacteria by giving them no space to grab on
- Stimulating the secretion of Immunoglobulin A, an antibody that fights infection

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Knowing how and why things can go wrong

Many factors influence the bacteria in your body, in both positive and negative ways. Diet, climate changes, stress, illness, and certain medications can affect the microbiota in your body. Medications such as antibiotics may alter your body's environment, decreasing the number of good bacteria and helping the bad bacteria and fungi (yeast) proliferate. *Clostridium difficile colitis*, an infection that causes diarrhea, and yeast infections are good examples. (See Chapter 2 for more on various forms of diarrhea and Chapter 3 for more on yeast and other types of infections.)

Imbalance in the gut flora (friendly versus harmful) can lead to digestive upset that, if left unchecked, can lead to far more serious health problems. Research indicates that some people have irritable bowel syndrome because of such an imbalance, for example (see Chapter 2).

Defining Prebiotics and Probiotics

The word *probiotics* means "for (or pro) life." In 2001, the World Health Organization (`www.who.int`) coined the following definition for probiotics:

> *"Probiotics are live microorganisms, which, when administered in adequate amounts, confer a health benefit on the host."*

In other words, probiotics are the "good" bacteria. Your intestinal friendly bacteria can be called your "indigenous probiotics."

Prebiotics are non-digestible food ingredients, like *inulin,* that stimulate the growth and/or activity of bacteria in the digestive

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system in ways believed to be beneficial to health and are not consumed by the bad bacteria. In the following sections, we take a closer look at how probiotics and prebiotics work.

Probiotics: The action figures

The concept of probiotics was born in the early 20th century when Russian scientist Elie Metchnikoff hypothesized that eating fermented milk products improved the life span of Bulgarian peasants. He concluded that fermented milk helped to "seed" the intestine with friendly bacteria, which suppressed the growth of harmful bacteria. Fermentation is adding bacteria or yeast to foods, which causes a chemical breakdown. Metchnikoff was the first to suggest that it would be possible to modify the gut flora by replacing harmful bacteria with useful microorganisms. He later won a Nobel Prize for his work.

Every society has consumed some type of fermented food on a daily basis, and anthropologists theorize this practice dates from prehistoric times. (See the nearby sidebar about Marco Polo for an example.) In the days before refrigeration, fermentation was the safest and simplest way of preserving foods.

Fermented milks are the best example of early probiotics. Milk turns sour in hot climates, so many people deliberately fermented milk to make curd, or yogurt. Today, the same curd or yogurt is made in a controlled environment by adding live cultures such as *Lactobacillus acidophilus* or *Lactobacillus bulgaricus*.

Marco Polo: Probiotics pioneer

Thirteenth-century explorer and tradesman Marco Polo, the first European to travel deep into the interior of China and Mongolia, mentioned *kefir*, a fermented milk drink, and its "magical properties," in his travel journals. Some historians think kefir may have contributed to the high survival rate among Marco Polo's sailors at a time when many seamen died of intestinal disorders. Kefir is one of the oldest known fermented milk products, but it wasn't generally known outside the Caucasus region (at the border between Europe and Asia) until the 19th century. To learn more about kefir's interesting history, visit `www.kefir.biz/history.htm`.

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Probiotics are categorized using Latin nomenclature that identifies genus and species, respectively. So *Lactobacillus* means a bacterium that produces lactic acid (milk acid), and *acidophilus* means the bacterium is a species that grows well in acid environments, such as your stomach.

Probiotics perform useful functions when ingested:

- They alter the gut flora pattern to your benefit and adhere to the intestinal wall, crowding out harmful bacteria.
- They produce *antimicrobial* substances (enzymes or proteins) that inhibit or kill bad bacteria.
- They produce compounds the cells lining the GI tract can use as energy.
- They boost immunity by increasing production of *mucin,* proteins found in saliva and the mucosal linings of your GI tract, which help protect against friction and erosion and create an unfavorable environment for bad bacteria.

Prebiotics: The support team

Prebiotics are a relatively new concept, being identified in 1995 as food ingredients that pass through the digestive system without being digested. Probiotic microbes in your system use prebiotics as food, so prebiotics help probiotic bacteria grow and flourish.

Prebiotics' important properties include:

- Healthy bacteria-building potential
- Starch and sugar replacement capabilities
- Improving gut health as fiber

Probiotics and prebiotics work together to maintain gut health in different ways. To get the full benefits of both, so-called *synbiotics* combine them. The three most common prebiotics are *inulin, oligofructose,* and *polydextrose.* When you shop for probiotic supplements, look for these prebiotics on the label.

Probulin is a classic example of a synbiotic, where the two elements (probiotics and prebiotics) work together as a one-two punch to your system.

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Deciding Whether Probiotics Are Right for You

As you age, the composition of your gut flora changes, making you vulnerable to problems because of a weakened immune system. Probiotic supplements have been shown to maintain intestinal health and aid the natural immune system.

Today, doctors around the United States are documenting increased incidences of digestive problems, leading to more interest in preventive health care. In the following sections, I discuss the benefits of adding probiotics to your daily regimen, as well as what you can expect when you first begin taking probiotics.

Aggressive marketing by the yogurt and probiotics industry is informing consumers about the benefits of taking probiotic and prebiotic supplements, and it is likely only a matter of time before people take a probiotic supplement just as they do vitamins and fish oil. Like these other supplements, probiotics not only treat or alleviate the symptoms of disease but also help maintain overall good health.

Understanding the benefits of probiotics

As I mention elsewhere, the concept of probiotics is an old one, dating to times before people really understood the benefits of their fermented foods. Today, researchers are putting hard science behind the folk remedy.

Even more exciting, though, is that probiotics seem to hold great promise for alleviating a broad range of health issues. In Chapter 3, we look at how probiotics may offer options to people struggling with health issues such as obesity, allergies, and urogenital infections. And in Chapter 5, we explore the intriguing possibilities of using probiotics to help prevent debilitating conditions like cancer and heart disease.

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Knowing what to expect when you start probiotics

On beginning probiotic supplements, many experience an increase in gas or bloating. These symptoms usually disappear within a week, and most people begin to notice a better sense of physical well-being after the initial effects wear off.

Your experience when you begin taking probiotics may differ, depending on your reasons for taking them. For example, if you get acute diarrhea while traveling, taking probiotics means you get over the diarrhea faster. If you're taking antibiotics for an infection, the chances of getting antibiotic-associated diarrhea go down if you also take probiotics. With more chronic bowel problems, taking probiotics improves bowel function — most see improvement within a few weeks.

Even if you're in perfect health, taking probiotics every day helps you maintain the proper balance of the bacterial flora in your GI tract. In today's world, you face environmental, dietary, and emotional stressors that cause changes in your gut flora. Taking probiotics on a regular basis helps you keep that balance even when such stressors have an impact.

Probiotics belong to the "generally recognized as safe" (GRAS) list compiled by the U.S. Food and Drug Administration (`www.fda.gov`). The GRAS designation means that experts consider these food additives — chemicals, preservatives, or other substances — safe for human consumption. Probiotics are considered so safe that they're now routinely added to infant formulas.

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Chapter 2

Checking Out Probiotics for Digestive Health

In This Chapter

- Looking into the causes of diarrhea and bowel disease
- Seeing how probiotics can treat or prevent digestive problems

Most people have done the frantic rush for a bathroom, legs clenched, teeth gritted — sure signs that you've been stricken with diarrhea. Usually, diarrhea is associated with a gastrointestinal illness, or some food you've eaten. The word *diarrhea* comes from Greek and means "flowing through," a perfect description of these loose, watery, frequent stools.

Although diarrhea is a relatively ordinary thing, it can be serious. Diarrhea is one of the most common causes of death in the world, in fact — especially in developing countries where it causes dehydration and electrolyte imbalance.

Physicians and consumers have used probiotics to help combat diarrhea for several years. Although much of the evidence is anecdotal, researchers have shown probiotics to be effective in treating diarrhea in at least some instances. In 2006, a national panel of experts recommended probiotics for anyone with antibiotic-related diarrhea or acute (short duration) diarrhea. The panel also said probiotics hold promise for irritable bowel syndrome and inflammatory bowel disease.

In this chapter, we look at some of the most common causes of diarrhea and explore how probiotics can help.

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Doing the Potty Dance: Probiotics and Diarrhea

Diarrhea can be *acute*, meaning of short duration, or *chronic* (of long duration). Acute diarrhea is often from infections, such as *viral rotavirus* (also called *gastroenteritis virus type B)* in children and *norovirus* in adults (producing symptoms commonly known as "stomach flu"), or from bacterial-related infections like *E. coli* or salmonella. Antibiotics also can cause acute diarrhea.

Acute diarrhea typically lasts 1 to 3 days, and symptoms usually clear up after the virus, bacteria, or antibiotics get out of your system. Chronic diarrhea, on the other hand, may flare up frequently and can be caused by any of the following:

- Irritable bowel syndrome (IBS)
- Inflammatory bowel disease, or IBD
    - Crohn's disease
    - Ulcerative colitis
- Lactose intolerance
- Malabsorption (difficulty digesting or absorbing nutrients from food because of problems with the pancreas or bowel, for example, celiac disease)
- Chronic alcoholism
- Parasitic infections

In the following sections, we take a closer look at some common causes of acute and chronic diarrhea and the role probiotics can play in alleviating symptoms.

Antibiotic-related diarrhea

Antibiotics often cause diarrhea because these medications tend to "wipe out" good bacteria, thus allowing bad bacteria (normally present in small quantities and kept under control by the good bacteria) to proliferate. One such "bad" bacterium is *Clostridium difficile*, commonly called *C. diff*.

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C. diff is a classic example of a bacterial imbalance getting you in trouble. When *C. diff* bacteria (or other bad bacteria) get out of control, the lining of your intestines is compromised, allowing toxins and/or bacteria to enter your bloodstream and decreasing your immune defenses. (See Chapter 1 for more on the balance between good and bad bacteria in your digestive system.)

Most of the time, this kind of diarrhea resolves by itself, or with symptomatic treatment. However, the incidence of *C. diff* has been increasing in epidemic proportions over the last decade. *C. diff* infection can spread easily from one person to another, especially in a nursing home or hospital setting if the staff doesn't clean toilets and other surfaces adequately. *C. diff* bacterial spores can survive on surfaces for a few days and are resistant to several cleansing solutions. Hence, you can get *C. diff* even when you haven't been on antibiotics.

If you're in the hospital for longer than four weeks, your chances of getting *C. diff* are more than 50 percent. In spite of treatment, *C. diff* can recur in some individuals, and probiotics are particularly helpful in this situation. In a hospital or nursing home setting, wearing gloves and washing hands with soap and water decreases the incidence of *C. diff* infection spreading among patients.

C. diff varies from mild to severe, and is even life-threatening in some cases. You can't take it lightly: An estimated 15,000 to 30,000 people die each year from *fulminant* (sudden and severe) *C. diff* infection in the United States alone.

Symptoms include abdominal pain, bloating, diarrhea, fever, and, in severe cases, bloody diarrhea, caused by toxins produced by the bacteria. Diagnosis is made by doing a stool test that looks for the toxin that *C. diff* produces, called a CDTA — *Clostridium difficile toxin assay*. If the test isn't definitive, or if the severity of the infection needs to be determined, your doctor may order a colonoscopy.

Historically, health care providers have routinely recommended that patients eat yogurt when they take antibiotics, and many doctors now are beginning to prescribe probiotics along with antibiotics. Pediatricians have been among the first to recognize the validity of this practice and have been moving quickly to prescribe the two together.

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Research certainly backs up the idea that taking a probiotic along with an antibiotic decreases the chances that you'll get a *C. diff* infection. Doctors typically use one of three drugs — metranidazole (brand name Flagyl), vancomycin (brand name Vancocin), or rifaximin (brand name Xifaxan) — to treat *C. difficile* infections. Research shows that taking probiotics for 30 days along with these medicines decreases the duration of diarrhea and recurrence of the infection. Occasionally, patients with severe *C. diff* may continue to get worse in spite of treatment and may need a *colectomy* (removal of the colon). *Lactobacillus GG* and *Lactobacillus acidophilus* have shown promise in treatment of *C. diff* and prevention of recurrences, and doctors typically prescribe them along with antibiotics. The probiotic yeast *Saccharomyces boulardii* has also shown some promise, primarily in treatment of recurrent *C. diff* infections.

Another option for treating *C. diff* (although not necessarily suitable for dinner-table conversation) is *fecal bacteriotherapy*, also called *stool transplantation*. Physicians in Australia have used stool from normal, healthy family donors to transplant into patients who are very sick with *C. diff* and have had good results saving patient lives. Family members tend to have similar types of bacteria. (Only a few centers in the U.S. have begun using this technique to treat severely ill patients.) The rationale is to reintroduce normal flora into the sick patient's colon, overcoming the *C. diff* bacteria and restoring bacterial balance in the colon (see Chapter 1).

Even though many people find the concept aesthetically unpleasant, this treatment option could save your life one day. In the near future, in fact, you may see a surge of probiotic enemas to treat *C. diff*, a procedure that would use the same rationale as bacteriotherapy.

Other types of diarrhea

Unfortunately, antibiotics aren't the only culprits in diarrhea. Several organisms can cause *infectious* diarrhea, and anyone who has traveled abroad likely has battled traveler's diarrhea (also known as Montezuma's Revenge). In the following sections, we take a closer look at these types of diarrhea.

Infectious diarrhea

Infectious (or contagious) diarrhea — which encompasses viral or bacterial gastroenteritis — can be caused by:

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- Viruses (*rotavirus* in children; others include *norovirus*, *adenovirus*, and *astrovirus*)
- Bacteria (*Campylobacter jejuni,* salmonella*,* shigella*, E. coli, C. diff*)
- Toxins of bacteria (staphylococcal toxins)
- Parasites (*Giardia lamblia*, *Entamoeba histolytica*)
- Worms (hookworm, pinworm, tapeworm — typically seen in developing countries, rare in the United States)

Since 2000, the rotavirus vaccine has helped to decrease the number of infectious diarrhea cases caused by the rotavirus. Typically, doctors use fluids to treat the symptoms of such infections; after a stool test identifies the cause, patients take the appropriate medicines to eradicate the actual infection.

Traveler's diarrhea or Montezuma's Revenge

One of the least pleasant aspects of visiting other countries is traveler's diarrhea (TD), estimated to impact around 10 million Americans each year. TD is defined as three or more stools in a 24-hour period when you are traveling outside of the U.S. TD's symptoms usually include abdominal cramping, bloating, and occasionally nausea. The source of infection is usually ingestion of fecally contaminated food or water. The most common cause of TD is *enterotoxigenic Escherichia coli* (*E. coli*). Other bacteria, parasites, and viruses have also been found to be causative agents.

TD usually goes away in three or four days, but around 10 percent to 20 percent of cases may take a week to run their course. Patients occasionally need hospitalization, primarily for dehydration. Most travelers learn to prevent TD by avoiding local water and ice. If you drink only sealed bottled water and make sure everything you eat is well cooked, you can often prevent the initial occurrence. *Bismuth subsalicylate*, found in products like Pepto-Bismol, also has been shown to reduce the incidence of traveler's diarrhea.

If you get TD, drink plenty of fluids and consult a doctor, because some patients may need antibiotics and IV fluids. Persistent symptoms may call for stool tests. Products like Imodium or Lomotil can help reduce symptoms, and you won't do yourself any harm by taking them. Before taking a trip overseas, start eating yogurt or kefir (see Chapter 1) or

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begin probiotics a few days before departure. Several probiotics (including *Saccharomyces boulardii* and *Lactobacillus acidophilus*) have been shown to be effective in preventing traveler's diarrhea.

Looking at Other Digestive Problems

Around 70 million Americans suffer from digestive problems, accounting for 37 million doctor visits and $50 billion in costs. Here I discuss other digestive challenges (besides diarrhea) and the role probiotics may play in treating them.

Inflammatory bowel disease

Inflammatory bowel disease, or IBD, refers to a group of autoimmune inflammatory conditions of the gastrointestinal tract. Ulcerative colitis and Crohn's disease, for example, are common IBDs. Ulcerative colitis affects the colon, whereas Crohn's may affect any area of the digestive tract (although primarily the colon and/or the small bowel).

IBD symptoms include abdominal pain, diarrhea, weight loss, rectal bleeding, and anemia. Crohn's disease can also cause *fistulas* (abnormal passageways between two organs in the body or between an organ and the exterior of the body) around the anus or on the abdominal wall.

Patients with either of these two IBDs are at a higher risk of developing colon cancer and need periodic colonoscopies. (And everyone, regardless of symptoms, should have a screening colonoscopy at age 50.)

Both conditions can go into *remission* (a temporary easing or disappearance of symptoms) with appropriate treatment. Studies have shown that probiotics can help prevent and treat IBD, and several studies have shown that probiotics can help prolong the remission period in IBD.

People with IBD have a decreased number of indigenous probiotics, or friendly bacteria, in the colon. That's true even when the IBD is in remission; the situation is worse when the IBD is active. Initial studies have shown a positive role for

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probiotics for ulcerative colitis, but proof for the effectiveness of probiotics in helping patients with Crohn's disease is unclear. At this point in the medical landscape, it seems that probiotics will have a role in treating IBD patients along with traditional, approved treatments. Several trials are under way to determine which probiotics are the most beneficial.

Irritable bowel syndrome

Irritable bowel syndrome, commonly called IBS and synonymous with *spastic colon*, *irritable colon*, and *sensitive gut*, is the most common chronic medical condition in the Western world. An estimated 15 million to 30 million people in the United States have IBS. For around 40 percent of IBS patients, the symptoms may be so debilitating that they have to take time off work and curtail their social life. IBS is a true disease of the gut and not a "mental condition," as some patients and even physicians believe.

IBS isn't the same as IBD. In IBS, the gut lining is always normal, unlike in IBD. However, even though the bowel isn't damaged, the intestinal muscles and nerves seem to be overly sensitive and overly reactive in IBS patients.

IBS is usually a diagnosis of exclusion, meaning your gastroenterologist will make sure that there is nothing more serious going on in your digestive system (like colon cancer or IBD; see the preceding section) with appropriate tests. IBS symptoms may include abdominal pain (cramping or bloating) associated with change in bowel habits. You may have constipation or diarrhea, or may alternate between the two.

The medical field has yet to determine the cause or causes of IBS. Here's what researchers have discovered so far:

- In most patients, IBS ("sensitive gut") means that people with IBS have increased or exaggerated response to stress or dietary indiscretions.
- In some patients, IBS seems to develop after a bout of diarrhea from either food poisoning or infection (post-infectious IBS).
- SIBO (small intestinal bacterial overgrowth) may cause IBS. Normally, the small intestine contains minimal bacteria; with SIBO, bacteria invade the small intestine.

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Looking at the placebo effect

When researchers test drugs for safety and effectiveness in controlled studies, participants are typically divided into three groups. One group receives the drug; a second group receives a placebo (or "sugar pill," with no medicinal properties); and the third, or "control," group receives no treatment at all.

The *placebo effect* is the phenomenon of patients (and sometimes even researchers) reporting improvement in symptoms when they haven't received any actual medicine. In *double-blind* studies, where neither the participants nor the researchers know who's receiving the actual drug and who's getting a placebo, the data are less likely to exhibit the placebo effect. However, patients are particularly susceptible, in part because (or so researchers believe) they *want* to believe they feel better.

There is no specific treatment or "cure" for IBS, so, for the time being, doctors treat the symptoms. Depending on what those symptoms are, you'll be treated with antispasmodics, antidiarrheals, and/or fiber (including products like Metamucil, Citrucel, and inulin) — plus meds that relieve constipation. Certain antidepressants have shown some promise in alleviating symptoms of IBS, and dietary adjustments and psychological interventions may help in some cases (because even though IBS is a true disease of the gut, stress can aggravate the symptoms).

Clinical trials have shown that probiotics can reduce IBS symptoms, especially if the patient has SIBO contributing to IBS. *Bifidobacterium infantis* has been studied extensively and decreases IBS symptoms. A number of other probiotics are effective to varying degrees, although the *placebo effect* is particularly high in GI studies (see the nearby sidebar, "Looking at the placebo effect").

Right now, there is no proof in medical literature that taking probiotics after a bout of diarrhea prevents development of IBS in the long run. As future research pins down more specific causes of IBS, many researchers and doctors expect that probiotics will play a greater role in treatment.

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Lactose intolerance

Lactose is the sugar that occurs naturally in milk. Sugar naturally occurring in fruit is *fructose*. *Glucose* is the sugar produced when you digest carbohydrates, the body's main energy source. Table sugar (*sucrose*) has glucose and fructose.

Lactose is a *disaccharide*, meaning it contains two sugars (galactose and glucose). Your small intestine's lining won't allow disaccharides to pass through into your bloodstream, so these molecules have to be broken down before your body can absorb them. *Lactase* is the enzyme that breaks down lactose.

People who are deficient in lactase often have *lactose intolerance*, which means that consuming milk (or other dairy products) may lead to abdominal cramps, gas, bloating, diarrhea, and nausea. Lactose intolerance is a common condition that affects millions of people: 15 percent of Caucasians are lactose intolerant, and it is particularly prevalent in developing countries in Asia and Africa, where an estimated 90 percent of the population is lactose intolerant. Researchers believe this high incidence is attributable to parasitic or bacterial infections common in those countries.

Probiotics can help break down lactose. Even if you're lactose intolerant, you may tolerate lactose-containing foods if you eat them in conjunction with probiotics. You can also try taking a lactase supplement before drinking milk. (However, many people choose to follow a lactose-free diet.)

Celiac disease

Celiac disease is an autoimmune disorder in which patients develop an allergy to gluten, found usually in wheat but also in some other grains. *Gluten* is a collection of proteins that aren't soluble in water; it gives dough its elastic texture.

Around 1 million Americans have celiac disease. Symptoms include diarrhea, bloating, and weight loss. Diagnosis is made typically by doing blood tests and an upper *endoscopy* (a visual examination of the upper GI tract, using a tiny camera called an *endoscope).* Sometimes testing includes taking a biopsy of the small intestine to see if there are any changes in the intestinal lining. Early evidence suggests that probiotics may help in celiac disease, but more research is needed.

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Other digestive disorders

Americans are more stressed than ever, and one result is an increase in peptic ulcer disease. In addition, media campaigns have raised awareness of colon cancer, a disease that is 90 percent preventable and 90 percent treatable.

Peptic ulcer disease

Ulcers (open sores) are fairly common and can occur in the stomach or *duodenum* (the first part of the small intestine just beyond the stomach). In most patients, ulcers are caused by the *Helicobacter pylori* bacteria. Ulcers can occur for other reasons, too, such as stress and use of non-steroidal anti-inflammatory drugs (NSAIDs, such as ibuprofen).

Probiotics have been found to decrease the number of *H. pylori* bacteria in the stomach. However, whether taking probiotics leads to fewer ulcers is unproven. Antibiotics are the usual treatment for *H. pylori*, and studies have shown that if patients take probiotics along with antibiotics, the chance of eradication of *H. pylori* is higher. (In addition, the chance of getting antibiotic associated diarrhea is lower; see "Antibiotic-related diarrhea" earlier in this chapter.)

Colon cancer

What did Ronald Reagan, Audrey Hepburn, and Pope John Paul II have in common? Colon cancer. More research needs to be done about how probiotics can help in treating this deadly disease. However, early research indicates that probiotics keep the bad bacteria in check, which may help prevent colon cancer because bad bacteria can make enzymes that produce cancer-causing substances. Probiotics also may help stimulate the immune system to destroy abnormal colon cells.

Prebiotics (see Chapter 1) appear to play a part in this situation as well, protecting against colon cancer by helping in production of short-chain fatty acids (SCFA). Gut flora and probiotics ferment prebiotics and produce SCFAs, which are the primary fuel for the colon epithelium. Research has shown the higher the number of SCFAs, the lower the incidence of colon cancer. Prebiotics are also fibers, and evidence has shown a high-fiber diet decreases the incidence of colon cancer. As in other areas of probiotic research, stay tuned for future developments in this arena.

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Chapter 3

Applying Probiotics to Other Health Issues

In This Chapter

- Exploring allergic reactions
- Aiming for urinary tract health
- Keeping your mouth and sinuses healthy
- Managing your weight
- Promoting children's health in the womb and after birth

Probiotics aren't just for gastrointestinal diseases. Researchers are finding a multitude of uses for probiotics that go far beyond helping your digestive system (which is discussed in Chapter 2).

The list of probiotics' beneficial effects now includes, among other things:

- Alleviating allergy symptoms
- Improving oral and sinus health
- Relieving yeast infections
- Preventing problems during pregnancy

In fact, researchers are investigating how probiotics may help protect you against such biggies as cancer and cardiovascular disease (Chapter 5 talks more about these promising areas).

In this chapter, I explore the role of probiotics in treating some quite common ailments, from allergies to tooth decay.

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Understanding Allergies

Allergies are "altered reactions," derived from the Greek words *allos* (meaning different or changed) and *ergos* (meaning work or action).

In medical terms, an allergy is your immune system's exaggerated response to contact with a "foreign" substance, but it's usually a misguided reaction. Your body perceives an *allergen* — an allergy-producing substance — as dangerous when it's really not.

Most of the time, your body recognizes allergens as harmless and ignores them. But if you're allergic to a particular substance — cat hair, pollen, or mold, for instance — your body snaps to attention, producing an overblown response. Fifty million people in the United States have allergies, with nasal allergies or hay fever, asthma, allergic eczema, and hives being the most common conditions.

Although it's unclear what causes allergic reactions, the *hygiene hypothesis* is most widely accepted theory in the medical field. The idea is that increasing use of sanitizers means people aren't exposed to microbes to the extent they were decades ago. Childhood exposure to microbes is beneficial in the long term because it lessens the likelihood you'll develop allergies. In fact, if you have older siblings, you have a reduced chance of developing allergies because you're exposed to more viral infections, which boosts your immune system. There are more allergies in developed countries than in developing countries — likely because people in less-developed areas are exposed to more bacteria and viruses and therefore develop a tolerance for them.

Babies born by C-section take a long time to achieve bacterial colonization compared to babies born by vaginal delivery, because they don't swallow vaginal bacteria (see Chapter 1). Some studies point to increased allergies in children born by C-section.

In the following sections, we look at three areas in which probiotics may help treat or prevent some allergic reactions: hay fever and asthma, eczema, and food allergies.

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Nothing to sneeze at: Hay fever and asthma

Hay fever (*allergic rhinitis*) is the most common allergic reaction and can be seasonal, caused by pollen, or year-round, caused by indoor allergens such as dust mites or mold. Symptoms include runny or stuffy nose, sneezing, nasal itching, post-nasal drip, and itchy ears and throat.

Asthma, which is frequently caused by allergies, causes shortness of breath because of inflammation and spasm of the lung's airways. Asthma sufferers may also experience wheezing, coughing, and chest tightness. Asthma is a common childhood chronic disease.

Probiotics may be useful in moderating the immune response that occurs during an allergic reaction, decreasing the severity and incidence of allergic disorders. Bacteria studied as being helpful for allergies include *L. planatarum*, *L. rhamnosus*, *L. casei*, and *L. bulgaricus*. Initial studies of the bacteria *Lactobacillus casei shirota* show positive results for decreasing hay fever symptoms, but the research isn't conclusive yet.

Scratching away at eczema

Eczema, or *atopic dermatitis,* is the first sign of allergy in the early days of life and is attributed to the immune system's delayed development. This common inflammatory skin disorder in early childhood sometimes continues into adult life. It affects between 10 percent and 20 percent of infants, but many kids grow out of it by age 5 to 15. Forty percent of kids with eczema develop asthma later in childhood.

Probiotics have been successfully used in treatment of eczema. Bacteria studied include *Bifidobacteria* and *Lactobacilli*. According to a study from the Netherlands, daily supplementation with probiotics prevents asthma-like symptoms in children with eczema. In addition, taking prebiotics has been shown to decrease the incidence of eczema in children.

Research studies indicate that if a pregnant woman with eczema takes probiotics during pregnancy, and the newborn is also given probiotics for several months, there is a decreased chance the baby will get eczema.

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Combating food allergies

Food allergies occur when the immune system attacks a food protein. Any food can cause an allergic reaction, but the most common food allergy is sensitivity to peanuts, and sometimes other nuts like pecans and walnuts. Other food allergies include eggs (usually to the proteins in egg whites); cow, goat, and sheep milk or dairy products; soy; wheat; and shellfish.

Symptoms of food allergies include nausea, vomiting, diarrhea, abdominal pain, hives, and itching. Symptoms can be life-threatening when the tongue swells or breathing becomes difficult.

Early research shows that probiotics alleviate food allergies, but conclusive evidence isn't available yet.

Tackling Urogenital Infections

More than 75 percent of women have less-than-optimal vaginal health, and a third of the 75 percent test positive for *bacterial vaginosis,* an infection caused by an imbalance in vaginal bacteria. This bacterial imbalance increases risks for urinary tract infections (UTIs), sexually transmitted diseases (STDs), and pre-term labor.

When they have a vaginal problem, many women self-medicate using over-the-counter yeast infection treatments. Unfortunately, these treatments may not be effective and can even be counterproductive, actually increasing the colonization of harmful bacteria (see Chapter 1).

Research has found that probiotics help in treating or preventing many infections of the urinary tract and genitals (urogenital). In the following sections, I look at three common urogenital problems: bacterial vaginosis, UTIs, and yeast infections.

Battling bacterial vaginosis

Bacterial vaginosis (BV) is the most common cause of vaginal infections (not to be confused with yeast infections). Symptoms include an off-white vaginal discharge, often

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accompanied by an unpleasant smell. Treating BV with antibiotics helps only 40 percent of women, but results are better when probiotics are added to the treatment.

Cigarette smoking, use of IUDs, frequent douches, and multiple sex partners increase the incidence of BV.

Multiple research reports show the benefits of using *L. acidophilus* to treat BV; in many of these studies, the probiotic was administered via vaginal suppositories. A smaller number of studies found that eating yogurt enriched with *L. acidophilus* may be beneficial, but results weren't definitive.

Squelching urinary tract infections

UTIs are caused by a bacterial infection anywhere in the urinary tract. Symptoms include frequent need to urinate, pain during urination, and sometimes cloudy urine. Women are more prone to UTIs than men, with 50 percent developing the infection during their lifetime, and half of those women have recurrent problems. In addition to being female, having frequent intercourse and using catheters increase the risk of UTIs.

The most common organism causing UTIs is the *E. coli* bacterium. The usual treatment is a short round of antibiotics. Research shows that women who consume fermented milk products containing probiotics (such as yogurt and kefir, a fermented milk drink) have a lower incidence of UTIs. A recent U.S. study showed that recurrent UTIs were markedly reduced in women who used vaginal suppositories containing probiotics.

Tamping down yeast infections

Most women — about 3 in 4 — will have a yeast infection at least once in their lives. These fungal infections are typically caused by *Candida albicans*. Symptoms of a yeast infection include a whitish discharge, vaginal itching, and soreness.

Yeast infections often occur after antibiotic treatment, but can also occur after steroid use, while using birth control pills, and with frequent douching. Treatment typically consists of

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using an antifungal medication like miconazole (sold under the brand names Aloe Vesta, Baza, and Cruex Prescription Strength) or clotrimazole (Lotrimin and Gyne-Lotrimin, Desenex, and so on) as a topical cream or orally.

L. acidophilis, *L. rhamnosus*, and *L. fermentum* have been shown to prevent and treat yeast infections. Many doctors are beginning to recommend that patients take a probiotic along with antibiotic prescriptions, particularly for women who have a history of yeast infections.

Promoting Oral Health with Probiotics

In spite of preventive oral care such as brushing, flossing, antiseptic rinsing, and frequent dental appointments, oral diseases are on the rise. Eighty percent of Americans over 30 years old have or have had inflammation of the gums (*gingivitis*), tooth decay or cavities, bad breath, or *periodontitis* (destruction or loss of bone structure and teeth). These conditions result primarily from poor oral hygiene. With more than 1,000 different organisms living in your mouth, a balance among them is essential for good oral health.

Streptococcus salivarus (the good guy) is a prominent part of the oral microbiota and shows excellent potential for use as a probiotic targeting the oral cavity.

Streptococcus mutans (the bad guy) tends to colonize the surface of teeth and may be responsible for breaking down your tooth enamel. Probiotic gum reduces the concentration of *S. mutans* by causing the microbes to clump and stick to the teeth — which makes them easier to brush, floss, and rinse away.

Two probiotic supplements have been clinically shown to improve oral health: GUM PerioBalance (*Lactobacillus reuteri*) and Evoraplus (*Streptococcus oralis*, *Streptococcus uberis*, and *Streptococcus rattus*).

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Promoting Sinus Health with Probiotics

More than 40 million Americans suffer from sinus infections every year. You have eight *sinuses* (hollow cavities) in your skull: on the forehead, behind the cheekbones, between the eyes, and behind the eyes. Your sinuses help your body's immune defense by filtering harmful bacteria and viruses.

The symptoms of a sinus infection include facial pain, headache, cough, and postnasal drip. The infections can be caused by allergies, bacteria, and fungi.

Probiotics, especially *Bifidobacteria bifidum* and *Lactobacillus acidophilus,* have been shown to support nasal sinus health. They reduce the frequency of relapses of sinus infections by colonizing the sinus and nasal cavities with friendly bacteria, preventing the colonization by bad bacteria.

Maintaining a Healthy Weight

According to the National Institutes of Health (`www.nih.gov`), more than two-thirds of American adults aged 20 or older are either overweight or obese. *Obesity* is defined as a *body mass index* (BMI, a ratio of your height and weight) of 30 or higher. *Overweight* is a BMI of 25 to 29. A BMI over 40 is considered *extreme* or *morbid* obesity.

Although no one knows for sure how probiotics may affect your ability to keep your weight down, research is beginning to find connections between weight and gut bacteria. Dr. Jeffrey Gordon at the University of Washington reported that the microbial population in the gut is different in obese people than it is in lean people. His studies suggest that obesity probably has a microbial component; he found that when obese individuals lose weight, their gut flora changes to a composition similar to that in lean people.

Meanwhile, researchers in Ireland created a strain of *Lactobacillus* that significantly changed the composition of fatty tissue in mice. It's too early to tell whether (and how) probiotics affect weight in humans, but this is likely to be an

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area of intense research, given the prevalence of obesity in the U.S.

A surge of diets, exercises, pills and other weight-loss products have appeared to combat the obesity problem. It's not uncommon to hear about people struggling to lose weight and then gaining it right back.

Studies done in mice and human beings are showing evidence that sometime in the near future we will be using probiotics for weight management. Researchers from the University of Tennessee showed that consuming three to four servings of dairy products a day can help you shed more pounds than cutting out dairy (a common but erroneous weight loss tactic).

By taking probiotics and prebiotics, it's possible the next "big thing" in weight management may be balancing the good bacteria in the digestive system. A Stanford University study in 2008 found that probiotics helped adult gastric bypass patients lose even more weight. Probiotics were given to these patients to improve GI functioning and quality of life. But those patients lost more weight than expected.

The answer to obesity may be not only an exercise plan and healthful eating, but taking probiotics as well.

Using Probiotics During Pregnancy

Studies show that consuming probiotics during pregnancy offers several advantages for mom and the baby. Mom benefits because she

- Is 18 percent less likely to deliver a preterm baby.
- Loses baby weight faster after delivery.
- Is less likely to develop *central obesity* (belly fat).
- Has a 20 percent lower chance of developing *gestational diabetes* (the presence of high blood sugar during pregnancy), which increases the risk of subsequent development of diabetes after pregnancy.

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The baby benefits when mom uses probiotics during pregnancy, too. The baby

- Has a lower risk of developing a serious condition called *necrotizing enterocolitis*, or the death of intestinal tissue.
- Is 50 percent less likely to get eczema.
- Is less likely to develop asthma.
- Has a decreased chance of developing childhood obesity and diabetes.

Keeping Children Well

A child's immune system isn't fully developed and is continuously challenged by environmental factors such as infections (bacterial and viral) at daycare centers and schools, allergens and irritants in foods, chemical toxins, and by antibiotic use. All these factors make probiotics even more important for children. Probiotics not only improve their digestive functions but also help support their weaker immune functions. Probiotics may even decrease allergy sensitivity in children.

Several studies indicate that giving probiotics to children at an early age reduces the severity and duration of a variety of diseases. For example, some studies reported that after administration of probiotics colds and flus decreased by 50 percent, and diarrhea from viral infections also was decreased.

Autism and childhood obesity are of special interest in the study of how probiotics may help children. Although the research is far from complete, scientists are looking at how these conditions may be related to bacteria in the body. We take a closer look in the following sections.

Autism and probiotics

Autism Spectrum Disorders is a group of neural development disorders characterized by impaired social interactions and communication, emotional outbursts, and restrictive and repetitive behaviors. Signs of autism usually develop gradually, and parents begin noticing it in the first two years of a

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child's life. Occasionally, children may show normal development and then regress. An estimated 500,000 people in the United States suffer from some degree of autism.

Autism has a strong genetic connection, but early research indicates that it may be exacerbated by environmental factors like toxins, antibiotics, bacteria, viruses, and nutritional deficiencies.

Although research on the use of probiotics and autism is still in its infancy, there is some indication that gut bacteria is different in individuals exhibiting autism symptoms, and interest is growing in exploring the role that gut pathology may play in this disorder.

Childhood obesity

Childhood obesity is on the rise; one in three kids in the United States is obese. Babies who are big at birth (generally weighing more than 8 pounds, 13 ounces, or are in the 85th or higher percentile of height and weight measurements) are at higher risk for becoming overweight later in life. Studies have found that women who take probiotics during pregnancy (see the section "Using Probiotics During Pregnancy" earlier in this chapter) have a decreased risk of developing gestational diabetes, which is one of the most common causes of large babies.

Breast-fed babies are at a lower risk for later obesity than non-breast fed babies. Scientists also know that *Bifidobacteria* are prevalent in the guts of breast-fed babies. And, just as in adults, it appears that lean children have higher levels of *Bifidobacteria*.

Based on the hygiene hypothesis (see the section "Understanding Allergies" earlier in this chapter), kids who aren't exposed to enough microorganisms to stimulate their immune system could benefit from probiotics. So doesn't it make sense for every kid born in the United States to be on probiotics or at least eat probiotic-rich foods? Chapter 4 discusses this in more detail.

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Chapter 4

Adding Probiotics to Your Life

In This Chapter

- Gobbling up foods that contain probiotics
- Checking out probiotics in snacks and drinks
- Adding probiotic supplements to your diet

Probiotic-rich foods contain live, beneficial bacteria. Incorporating these foods into your daily diet is an easy way to make sure you reap the benefits of good bacteria. There's nothing new about some of this: Before refrigeration, *fermentation* — adding bacteria or yeast to foods, which causes a chemical breakdown — prolonged the shelf life of foods such as cabbage (sauerkraut) and milk (yogurt).

In this chapter, you discover how to get the most out of the food on your plate by adding probiotic-rich choices to your diet. Of course, probiotics work best when they're combined with prebiotics — the stuff probiotics live on (see Chapter 1) — so I also cover prebiotic-rich foods. Finally, this chapter explores your options with probiotic supplements and offers an understanding of how to figure out the proper dose for your needs.

Choosing Probiotic-Rich Foods

Donna Gates created the first probiotic diet in the United States, proving how easy it is to add probiotics naturally. Her Body Ecology diet (`http://bodyecology.com`) highlights probiotic-rich foods that help rebuild proper digestive function and recover immunity.

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Looking at common bacteria in probiotic foods

The buzz phrase now in the food industry is "functional foods," meaning that manufacturers add beneficial products to foods to encourage customers to buy them. They might add bacteria (probiotics), vitamins, or antioxidants.

Probiotic foods contain a variety of bacteria. The most common include:

- *Lactobacillus acidophilus*
- *L. bulgaricus*
- *L. casei*
- *L. johnsonii*
- *L. reuteri*
- *Bifidobacterium lactis*
- *B. breve*
- *B. infantis*
- *B. longum*
- *Streptococcus thermophilus*

See Table 4-1 for bacteria commonly found in certain foods.

Table 4-1 Bacteria Commonly Found in Foods

Food	*Bacteria*
Yogurt	*Lactobacillus bulgaricus, Streptococcus thermophilus, Lactobacillus acidophilus, Bifidobacteria*
Cheese	*Lactobacillus* strains
Kefir	*Lactobacillus* and *Bifidobacteria*
Pickles, sauerkraut, miso, kimchi	*Lactobacillus*

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How to make homemade yogurt

Making homemade yogurt could hardly be easier. Bring some milk to a boil, just to the point where it begins to froth, on the stovetop or in the microwave. (The amount of milk you use is the amount of yogurt you'll have in the end. I typically use a half gallon of milk.)

Let cool until lukewarm and add 1 teaspoon of yogurt containing live bacteria. You can buy yogurt with live cultures in the store, use a yogurt culture starter, or borrow a yogurt starter from another family who makes yogurt.

Mix the yogurt culture into the milk, then cover and let stand somewhere warm. (My family makes yogurt every evening. We leave it sitting overnight in the microwave, which seems to retain heat.)

You'll have yogurt the next morning!

The U.S. Food and Drug Administration requires that any product called "yogurt" must contain *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. But that doesn't mean those products contain the *live* cultures that are necessary to get probiotic benefits. Check the label to make sure the product contains live cultures.

Determining which foods have probiotics

If a label says "contains live (or active) cultures," you can look at the ingredient list to see which bacteria are in the product. Some food products contain probiotics simply because of their manufacturing process (such as sauerkraut).

In the following sections, we look at some foods that either have probiotics added by the manufacturer or contain probiotics naturally.

Yogurt

Even though U.S. yogurts contain *L. bulgaricus* and *S. thermophilus*, manufacturers add other bacteria such as *Lactobacillus acidophilus* and *Bifidobacteria*.

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Look at the label or the company's website to see if cultures are added before or after pasteurization. Unfortunately, some yogurt companies *pasteurize* (heat) the yogurt after the cultures are added, which kills the good bacteria as well as the bad. If the label specifies "live cultures," that means the cultures were added after pasteurization.

When sweeteners and flavors are added to yogurt, they may reduce the probiotic effects of live cultures. Homemade yogurt is an alternative. In India, people commonly end a meal with homemade yogurt to help with digestion.

Other dairy products

Several dairy products contain naturally occurring probiotics or are fortified with probiotics. The following foods are some examples:

- **Buttermilk:** Buttermilk is the sour liquid left over when cream or whole milk is churned for butter. Manufacturers also make buttermilk by adding microorganisms to sweet milk. Either way, buttermilk contains probiotics.
- **Cheese:** The longer cheese is aged, the higher the probiotic content. Some manufacturers add probiotics; Kraft LiveActive cheese products, for example, contain *B. lactis* and *L. rhamnosus*.
- **Kefir:** This fermented milk drink has cultures made from various lactic acid bacteria and also the yeast *sacchromyces*. Kefir, now available in the organic dairy section of many grocery stores, usually contains more strains of bacteria than yogurt, but has a lower total bacterial count gram-for-gram.

Nondairy foods

Several foods are rich in probiotics, often because they're fermented. However, sometimes modern processing can kill the probiotics, so you need to read labels carefully.

Examples of nondairy probiotic-rich foods include:

- **Sauerkraut:** Sauerkraut is fermented cabbage, created by allowing lactic acid bacteria (which are in the air) to sit in it over time. Commercial sauerkraut manufacturers sometimes kill the helpful bacteria during processing; buy only brands that specify "uncooked" on the label.

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You can make sauerkraut at home with just cabbage and sea salt; BoingBoing has an easy recipe with photos at `http://boingboing.net/2009/01/12/making-sauerkraut-is.html`.

Kimchi is a spicy Korean version of sauerkraut, also made from fermented cabbage. One study of kimchi found 31 strains of *Lactobacilli*.

- **Miso:** Miso is a fermented Japanese seasoning made from various beans and grains and used as a sauce, spread, or in soups. Add it to a hot dish only after you're done cooking it; heat kills probiotics.
- **Pickles:** Pickles, or cucumbers fermented in vinegar, contain probiotics as long as they aren't pasteurized. The pasteurization process kills probiotics.
- **Microalgae:** Microalgae supplements are made from ocean-based plants such as spirulina and blue-green algae.
- **Tempeh:** A high-protein soy product, tempeh has the chewy texture of meat. Unlike tofu, which is made from soybean milk, tempeh uses fermented whole soybeans. You can find tempeh at health food stores.

Exploring probiotic snacks and drinks

As medical science has begun to research and recognize the positive contributions probiotics make to your diet, the business community is paying attention to the trend. The United States is a little behind in the world market, but one market report suggested the global probiotics market will be worth $32.6 billion by 2014.

As companies move to grab a slice of this market, your local health food and conventional grocery stores will add a plethora of probiotic products to their shelves. Products you may encounter include:

- **Probiotic "shots":** Popular in other countries, these drinks are newly arrived in the United States. Look for DanActive (*L. casei*), Activia (*Bifidus regularis*), GoodBelly (*Lactobacillus plantarum* and *B. lactis*), and

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Yakult (*L. casei Shirota*). Other probiotic drinks include kefir beverages from Lifeway and BodyEcology; some fruit juices also now have probiotics.

- **Probiotic snacks:** ShaSha Bread Co.'s buckwheat snacks contain prebiotics and probiotics (inulin is the prebiotic, and *Bacillus coagulans* is the probiotic). Other probiotic snacks include Kraft LiveActive granola bars and Attune chewy chocolate and peanut butter and chocolate granola bars.
- **Probiotic chocolate:** Youngevity (`www.youngevity.com/`) Triple Treat Chocolate encapsulates *L. helveticus* and *B. longum* so they aren't destroyed by the stomach acid. Ganeden Labs and Agostoni Chocolate have partnered to make several private-label chocolates with Ganeden's patented BC30 probiotic; the chocolates are available at a variety of health food and nutrition stores and may even be available at your local grocer's.
- **Kombucha:** A tart and tangy beverage made from fermented tea, kombucha is a great vegan source of probiotics. BAO (`www.drinkbao.com`) makes BAO FRESH kombucha drinks, which is a slightly fizzy alternative to unhealthy sodas.
- **Naked Pizza:** Naked Pizza (`www.nakedpizza.biz/`) puts probiotics, including Ganeden BC30, in its crust and other ingredients.

Looking at other probiotic products

Probiotics aren't just for food. They're showing up in an ever-expanding range of products, from suppositories and enemas to facial cleansers (such as Clinique's Probiotic Cleanser) and pet products. Even sunblock lotions and drinking straws are made with probiotics these days.

In 2003, a Swedish biotech company, Ellen AB, began selling probiotic tampons in 2003 with natural fibers treated with lactic acid bacteria. They have been shown to decrease yeast and urinary tract infections in women (replacing the longtime household remedy of dipping a tampon in yogurt).

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Other products with probiotics include:

- Gum/mint for oral and teeth health (www.profreshmint.com)
- Face creams (such as Epicuren acidophilus probiotic cream)
- Soaps (Dr. Ohhira's Probiotic Kampuku soap)
- Makeup (Clinique SPF 15)
- Anti-aging serums (Bioelements)
- Skin brighteners (Miessence)

Finding Prebiotic-Rich Foods

Prebiotics are fibers that help probiotics thrive and multiply. The standard American diet — full of processed foods, sugar, and low in fiber — is lacking in prebiotics.

Prebiotic-rich foods include oats, chicory, banana, garlic, and onions, all of which contain inulin. Other foods rich in prebiotics include raw chicory root, raw Jerusalem artichoke, raw dandelion greens (each of which are 25 percent prebiotics by weight), as well as raw leeks, raw asparagus, raw wheat bran, whole wheat flour, artichokes, barley, legumes, beans, flax seed, and oats.

Look for prebiotics in the ingredient list, usually listed as inulin and oligofructose. Other prebiotics to look for include fructooligosaccharides (FOS), galactooligosaccharides (GOS), xylooligosaccharides (XOS), lactulose, and polydextrose.

Selecting and Using Probiotic Supplements

Even though probiotic-rich foods should be an important part of your life, you probably need probiotic supplements to ingest enough bacteria to make a difference. Supplements are especially important if you're treating a specific illness, such as inflammatory bowel disease (see Chapter 2) or other health issues.

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Even people in the medical profession would be at a loss in the supplements aisle of the grocery store or shopping online for probiotics. Because the research is still in its infancy, specific recommendations about how much good bacteria you should take (or, in some cases, which strain will help particular diseases) just aren't available. However, here are some points to keep in mind:

- **What goes in your mouth does not necessarily reach your colon.** Good bacteria can't help you if they don't survive your stomach acid. Look for products labeled "encapsulated" or some other indication that they use technology to help the good bacteria reach your colon.
- **More strains of bacteria are better than one.** Make sure your supplement includes *Lactobacillus* and *Bifidobacteria* strains. Also check for prebiotic ingredients like inulin; prebiotics make the probiotic bacteria more effective. (Probulin is a good example of this kind of supplement.)
- **Always check the expiration date and storage information.** Some supplements need to be chilled; even those that don't require refrigeration should be stored away from heat.

Heat destroys probiotic bacteria, so don't drink coffee, hot tea, or other hot beverages for an hour after you take probiotics in any form — either as a supplement or in foods.

Understanding how probiotics are made

The first probiotics were manufactured hundreds of years ago through fermentation, which was used to extend the shelf life of food. Kefir, for example, was fermented by adding kefir seeds to milk that was stored in a bladder and hung in the doorway. When people went through the door, they jostled the bladder, mixing the kefir and promoting the fermentation process.

Modern production isn't too dissimilar from the traditional way of making kefir. In place of bladders, companies use large fermentation vessels that maintain an optimal temperature

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for whatever bacteria is being grown. In place of milk, manufacturers use milk substitutes that contain many milk components like proteins, lipids (fats), and carbs.

Bacterial cultures have to be grown in the proper medium to ensure abundant quantities. No manufacturer will tell you exactly what fermentation media they use because that's the key to their business success (just as Coke or Pepsi wouldn't give away their secret ingredients). The *media* is what the bacteria develop in — the "secret sauce" that grows the good bacteria. A lot of research goes into selecting media. When bacterial growth reaches the expected concentration levels, the product is harvested or removed from the medium. A centrifuge — a machine that spins like a big merry-go-round — separates the bacteria from the medium. After that, the probiotics are freeze-dried before being packaged. Freeze-drying removes moisture, which extends the life of the bacteria by prolonging suspended animation.

In recent years, several studies of probiotic products found that the products didn't contain as many bacteria as the manufacturer claimed on the label. Presumably, bacteria are lost somewhere in the process — during manufacturing, shipping, or storage. It's the bacterial concentration at the time of consumption that matters — not at the time of manufacturing. You're dealing with live bacteria, and the longer they're alive, the better!

Determining the dosage

As I mentioned, the more strains of bacteria in the supplement you take, the better. For example, Probulin has several types of bacteria. Single-strain formulations are less effective. No one's sure how many strains is the perfect number, but researchers do know that "more is better" when it comes to probiotics.

To promote general good health, take between 1 billion and 3 billion CFUs (colony-forming units) per day. More is better with CFUs, too. If you're dealing with an illness, you should take at least 5 billion to 10 billion CFUs per day. Always increase your probiotics when taking antibiotics and for one to two weeks after you stop taking the antibiotic to help combat the side-effects (see Chapter 2). Finally, if you travel

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abroad, up your dose of probiotics beginning two weeks before your trip and during your travels to maintain gastrointestinal health.

Although probiotics have an excellent safety record, they should be used with caution in babies born prematurely and in people with immune deficiencies, such as transplant patients and people with HIV. If you're taking immunosuppressive drugs or chemotherapy, consult with your doctor before taking probiotics.

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Chapter 5

Exploring the Promise of Probiotics in Preventing Disease

In This Chapter

- Looking at cancer prevention and treatment
- Keeping the heart and blood supply healthy
- Fighting autoimmune disease
- Promoting long life and mental health

Twenty years ago, the concept of probiotics was little understood. Today, as research accumulates and the role of probiotics is defined, U.S. doctors are beginning to use probiotics and prebiotics to treat a variety of diseases.

The next step in probiotic and prebiotic research is to determine how they can be used to prevent disease. As the critical role of gut flora in optimal health becomes more evident, it's clear that there's tremendous potential in adding good bacteria to your diet.

In this chapter, you discover what research is showing about how probiotics can help prevent or treat a wide range of diseases and conditions — from certain types of cancer to heart, kidney, and liver disease — as well as how probiotics may help promote weight management and longevity.

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Exploring Cancer Prevention

Few words in the medical world are more ominous than *cancer*. Tremendous advances in the past few decades have changed the way cancers are treated, upping the success rates for some cancers. Research also is delving into what you can do to prevent cancer, aside from the obvious things like avoiding cigarettes that can lead to lung cancer and high-fat diets that can lead to colon cancer.

That research has identified things you can do to increase the odds that you won't get particular kinds of cancer. A high-fiber diet helps protect against colon cancer, for example.

In the following sections, I discuss the current understanding of how cancer works and why it's so tough to beat, as well as intriguing research that indicates probiotics may help prevent certain types of cancer.

Understanding current cancer theory

"Cancer" is actually a collection of about 100 diseases that share some characteristics but differ in ways that make treatment challenging. In simple terms, cancer occurs when normal cells become abnormal as a result of genetic changes. Sometimes these genetic changes are inherited, but most often they occur because of environmental factors: diet, behaviors such as smoking, or exposure to harsh chemicals, pollutants, and even certain viruses.

Unlike normal cells, cancer cells

- Don't stop growing when they should.
- Don't die when they should.
- Divide more often and more rapidly than they should.
- Can migrate to other parts of the body and lie dormant for lengthy periods.

Cancer treatment typically consists of surgery, radiation, or chemotherapy — or some combination of these options. The

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problem with current treatments is that they all damage or destroy healthy, normal cells in addition to the cancer cells. Researchers are looking for ways to better target just cancer cells; meanwhile, other researchers are trying to determine ways you can prevent cancer cells from forming in the first place.

Seeing how probiotics may prevent cancer

Initial studies of the effects of probiotics on cancer appear promising. In one series of experiments, for example, two groups of rats were fed cancer-causing agents, but the rats in Group I were given probiotics. Group I rats didn't develop tumors, whereas the second group did.

The probiotic anti-cancer effect may be related to increased production of short-chain fatty acids (SCFA). One SCFA, *butyrate*, inhibits the growth of cancer cells and stimulates activity of an enzyme that acts as a detoxification system for potentially harmful compounds.

Combating colon cancer

Colon cancer is the second-leading cause of cancer deaths. Animal and *in vitro* (meaning in a culture dish in a lab) studies have shown that probiotics may lower colon cancer risk by reducing the incidence and number of tumors.

Preliminary data suggests that *Lactobacilli* and *Bifidobacteria* prevent mutation in genes, decreasing colon cancer incidence. Animals that received *Lactobacillus GG* showed a reduction in the activity of bacterial enzymes that play a role in causing cancer.

The data from human trials is circumstantial, and more studies are required to determine whether probiotics reduce the chance of developing colon cancer or slow its progression. However, three studies have shown positive indications for using probiotics and prebiotics to prevent and treat colon cancer.

A study published in the *American Journal of Clinical Nutrition* found that foods fortified with probiotics and prebiotics reduced certain markers of colon cancer in patients with

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colon cancer. This study provides the most direct evidence to date that the combination of probiotics and prebiotics benefits patients with colon cancer.

Studies in humans often take several years to complete. One quick way to get an assessment of a treatment's effectiveness is to use *biomarkers* — characteristics of cells or molecules that can be objectively measured — to determine levels of *toxic metabolites*, which are potentially harmful substances formed as the result of normal body functions. A Belgian study that used this method reported that consuming either a probiotic (*Lactobacillus* or *Bifidobacterium*) or a prebiotic (*oligofructose-inulin*) resulted in reduced levels of specific toxic metabolites.

Finally, in a European study of human patients, one group took a mixture of probiotics and prebiotics for eight weeks. They had less DNA damage and a lower rate of cell proliferation in their colon tissue samples than a control group, which didn't take probiotics or prebiotics. In addition, stool samples from the probiotics group had certain characteristics that indicated reduced cancer risk.

Considering bladder cancer

Bladder cancer is common and typically has a high recurrence rate. One clinical study found that patients with bladder cancer who took probiotics (*Lactobacillus casei*) had longer *remission* periods, in which the cancer didn't reappear.

A Japanese study also found that cancer patients who received probiotics took longer to develop the cancer and the cancers were not as severe when they recurred in probiotic-treated patients.

Treating cervical cancer

Treatment for cervical cancer consists of surgery in the early stages and chemotherapy and radiotherapy in the advanced stages.

One study of 228 women with advanced cervical cancer found that those who received probiotics had a higher four-year survival rate — 69 percent, versus 46 percent for women who didn't receive probiotics.

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Another study found that when probiotics were given before and during radiation for cervical cancer, patients had less radiation-related diarrhea. Nine percent of the probiotic group needed antidiarrhea medication, whereas 32 percent of the non-probiotic group needed antidiarrheals.

Slowing down lung cancer

Initial research shows that probiotics don't reduce the incidence of lung cancer, but may slow its growth. Cancer cell growth in lung cancer patients who received vitamin K2 was slower than in patients who didn't take the vitamin.

Probiotics may play a role here because they convert vitamin K1, which is common in vegetables, to vitamin K2 in the colon (which also may reduce the risk of colon cancer).

Treating Heart Disease

Fifty percent of all deaths in United States are caused by heart disease and strokes. The most common factors contributing to these illnesses are high cholesterol, smoking, high blood pressure, and diabetes.

The following sections discuss how probiotics may help alleviate these contributing factors.

Lowering blood pressure

Fifty million Americans have high blood pressure, often called "the silent killer" because many people have no symptoms. Blood pressure is measured in two ways: *systolic,* or the pressure when your heart beats while it's pumping blood, and *diastolic*, or the pressure of blood pushing against the walls of your arteries between heartbeats. Normal blood pressure is 120/80 (systolic/diastolic) or lower.

High blood pressure can damage your arteries and other blood vessels, as well as your heart, kidneys, and other organs.

Probiotic enzymes break down milk proteins, and the resulting products fight high blood pressure. Animal studies show that the probiotic *Lactobacilli* can reduce blood pressure.

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Keeping cholesterol in balance

Cholesterol has a good component (HDL) and a bad component (LDL). The higher the LDL levels, the higher the risk of heart disease. HDL, on the other hand, protects against heart disease.

Probiotics can break down cholesterol and use it in their metabolic processes, which decreases your cholesterol levels. Fermented milk and *acidophilus* have been shown to increase HDL and lower LDL, decreasing the chance of heart disease, and other studies have shown that *L. acidophilus* and *L. lactis* decrease cholesterol.

Probiotics also may decrease cholesterol by lowering the synthesis of cholesterol by the liver. Your liver uses cholesterol to make bile acids. Bile is stored in the liver and, when needed, pumped into the small bowel, where 95 percent of the bile is reabsorbed and makes its way back to the liver.

Probiotics make an enzyme that breaks down the bile salts that can't be reabsorbed. The liver then reaches out into the blood to get new cholesterol, which lowers the amount of cholesterol in the blood. All *Bifidobacteria* species, *Lactobacillus acidophilus,* and some other *Lactobacilli* have this capability.

Adding prebiotics to probiotics helps probiotics flourish (see Chapter 1), but prebiotics — because they're fiber — also directly work to decrease cholesterol.

Using Probiotics in Fighting Kidney and Liver Disease

The liver and kidneys get toxins out of your system and process nutrients from the foods you eat. Any interruption of the functioning of these two organs, whether through disease or more short-term illnesses, can cause serious health problems.

Breaking down kidney stones

About 1 in 20 Americans suffer from kidney stones at some point in their lives. Men tend to have more kidney stones than

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women, and stones tend to recur; in fact, for some, kidney stones are a lifelong problem. Sometimes kidney stones present no symptoms; other times, they cause severe pain and blood in the urine. In some cases, kidney stones can lead to kidney failure.

The most common type of stone (more than 80 percent of cases) is composed of *calcium oxalate,* a chemical compound that forms needle-shaped crystals. Your gut bacteria — primarily *Oxalobacter formigenes*, but also *B. lactis*, *L. acidophilus*, and *B. infantis* — normally break down oxalate. However, if you don't have these gut bacteria in adequate amounts, then your gut absorbs the oxalate and the burden of excreting it falls on the kidneys. When your kidneys can't excrete oxalate fast enough, you can develop kidney stones.

Probiotics help patients with kidney stones by breaking down the oxalate so it doesn't go to the kidney in the first place. A University of Boston study found that people who have a lot of *Oxalobacter formigenes* in their systems are 70 percent less likely to develop kidney stones.

In animal studies, oral probiotics decreased both *blood urea nitrogen* and *serum creatinine* levels, both of which measure kidney function. Probiotics have been used for cats and dogs for kidney failure for a long time.

Early evidence suggests that probiotics can postpone dialysis for people with kidney failure. But you'll have to stay tuned as more research is done on that issue.

Improving liver function

Your liver processes alcohol, drugs (including over-the-counter medications like ibuprofen), and toxins. Several prescription drugs are particularly harmful to the liver and can result in fatty deposits in the liver. Being overweight or obese also can generate fatty deposits in the liver, which can lead to inflammation, scarring, and even liver failure.

People who consume a lot of alcohol (more than two drinks per day for men, and more than one drink a day for women) are at particularly high risk for developing liver disease. But even nondrinkers can get liver disease, because the liver

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receives virtually all the blood flow from the digestive tract. So any toxins that you take in through food, drink, or drugs go through the liver.

Preliminary evidence indicates that probiotics reduce the absorption of *aflatoxin,* which is strongly linked to liver cancer, from the intestine. Probiotics may have a role to play in preventing liver cancer in people with *cirrhosis* (a chronic disease in which the liver is inflamed and scarred, usually from alcohol abuse or liver disease caused by toxins or viruses), who are at high risk for developing liver cancer.

End-stage liver disease, caused by various issues, can cause *hepatic encephalopathy,* which means toxins like ammonia aren't pushed out by the liver and thus affect the patient's nervous system. Cirrhosis patients have substantially altered gut flora, with overgrowth of disease-causing *E. coli* and *Staphylococcus* bacteria. In one study, probiotics increased the *Lactobacillus* species in the gut, and this increase was associated with decreased blood ammonia levels and decreased encephalopathy.

As the studies pile up, the role of probiotics in promoting healthy liver function is promising. But more human trials are needed in this arena.

Promoting Immune Function

Between 70–90 percent of your immune system is located in your digestive tract (see Chapter 1). Normally, your immune system recognizes and gets rid of harmful bacteria, viruses, and toxins, while leaving the "good" or harmless stuff alone.

In *autoimmune* diseases, the immune system attacks healthy cells and organisms. And, at least in some autoimmune diseases, an imbalance between good and bad gut flora (see Chapter 1) may be at least partially to blame.

Developed countries have a higher incidence of some autoimmune conditions such as Type 1 diabetes (often called *juvenile diabetes*). A low intake of prebiotic fiber adversely affects the intestinal microbiota, which leads to less production of elements that regulate the immune system, such as short-chain fatty acids (SCFA). Commonly, the modern Western diet

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consists of food that is processed, stored, transported over long distances, and is low in vegetables and fiber — which means your body makes fewer SCFAs, which in turn harms the way your immune system is regulated.

The hallmark of all autoimmune diseases is inflammation, or swelling. It doesn't matter which organ is affected; inflammation occurs. Autoimmune diseases can occur in any organ or tissue in your body. Examples include Type 1 diabetes, rheumatoid arthritis, psoriasis, multiple sclerosis, and lupus, among many others. If you have one autoimmune disease, your chances of developing a second one are higher.

A recent study showed that different strains of probiotics have greatly differing influence on your immune system. This important finding will help the medical community narrow research to specific bacteria that may be helpful for specific medical illnesses.

In the following sections, we look at how probiotics may affect diabetes and rheumatoid arthritis, as well as other autoimmune diseases.

Diabetes

Diabetes affects 220 million people globally and is responsible for 3.4 million deaths every year. There are several types of diabetes, including Type 1, which is an autoimmune condition; Type 2 diabetes, which occurs in adults and is often caused by lifestyle choices; and *gestational* diabetes, which occurs during pregnancy.

Preliminary data from Denmark suggests that the bacterial population in diabetics is different than that of people without the disease. This research opens up a potential role for modifying gut microflora with probiotics and prebiotics to improve health. Increasing numbers of diabetics in developed countries suggests that environmental factors contribute as well.

Several mice experiments using *Lactobacillus casei* showed that mice given probiotics had a smaller chance of developing diabetes. And a Finnish study on gestational diabetes found that combining probiotics with dietary counseling during and immediately after pregnancy reduced the risk of diabetes in mothers and provided a "safe and effective" tool for addressing childhood obesity (see Chapter 3).

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Rheumatoid arthritis

In *rheumatoid arthritis* (often called RA), your immune system attacks normal, necessary proteins for your joints. RA patients often suffer debilitating pain and deformation of joints, especially in the hands and feet.

Researchers have found that most RA patients have abnormal gut flora. In experiments with mice, probiotics with *Lactobacillus casei* slowed the progression of RA.

Research with human RA patients is still in the very early stages, but results so far appear promising. In one study, for example, 43 RA patients were divided into two groups; one ate food rich in *Lactobacilli*, and a control group ate a regular diet. After one month, stool tests showed significant diet-induced changes in fecal flora in the probiotics group, compared to the control group. The probiotics patients also reported improvement in their RA.

Another study involved giving probiotics with *Lactobacillus rhamnosus GG* to 21 RA patients over 12 months. Although there was no statistical improvement in patients' activity, they reported an improved sense of well-being.

Although research on probiotics and autoimmune diseases is still in its infancy, early results indicate that intestinal functions are often disrupted with autoimmune conditions, which changes the composition of gut flora. These changes may result in absorption of substances into the bloodstream, which may cause flare-ups of an autoimmune disease.

Probiotics seem to modify the immune system, making people less likely to develop autoimmune problems. Concrete research into many of these autoimmune diseases doesn't exist yet, but the theory that probiotics will have a positive impact is very likely valid. Stay tuned as researchers delve deeper.

Seeing What's on the Horizon

Seeing the many benefits of probiotics and the discoveries being made through international medical research during

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the past 20 years is exciting. The U.S. has lagged behind many countries in looking toward the future of probiotics, but is beginning to see the enormous potential on the horizon for this supplement (see Chapter 4).

Even in healthy people, regular probiotics use may help promote longevity and psychological health. In the following sections, explore what researchers have discovered so far in these two areas.

Promoting longevity

In the early 20th century, Elie Metchnikov became curious about the diet of Bulgarian peasants because of their long life, eventually discovering probiotics (see Chapter 1). Clearly, probiotics have some implications for aging well.

Doctors know that the numbers of *Lactobacilli* and *Bifidobacteria* in your gut decrease with age. In addition, your immune system becomes weaker as you get older (which is why senior citizens are strongly urged to get flu shots every year).

Probiotics and prebiotics may boost those decreasing bacteria in the gut and in turn boost the immune system. The stronger your immune system is, the less likely you are to succumb to illnesses that often cause serious problems for older people. The specific mechanics are still to be explored, but there's little doubt the fermented foods in their diet kept those Bulgarian peasants young!

Boosting wellbeing

Recent evidence suggests that probiotics can exert beneficial effects on your psychological wellbeing as well as on your physical health. Mark Lyte, professor at Texas Tech University's School of Pharmacy, proposed that probiotics produce neurochemicals that improve psychological health.

A French study of probiotics showed potential for their use to help stress-related conditions. *Lactobacillus casei*, for example, improved mood scores in normal subjects and decreased anxiety in subjects with chronic fatigue syndrome.

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Essentially, probiotics like *Lactobacilli* and *Bifidobacteria* produce neurochemicals in the gut that circulate through the bloodstream and induce behavioral changes. So probiotics seem to be able to promote good psychological health as well as good physical health.

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Chapter 6

Ten (or So) Things to Look for in a "Good" Probiotic

In This Chapter

- Checking the ingredients
- Understanding labels
- Talking to your doctor

All probiotics are not the same. Because probiotics are classified as dietary supplements — rather than as food or drugs — the U.S. Food and Drug Administration doesn't regulate them in the same way. The FDA has quality standards for dietary supplements and reviews new ingredients to ensure they're safe for human consumption, but the agency doesn't subject dietary supplements to the same rigorous safety and effectiveness requirements that food and drugs must meet.

That means choosing a good probiotic can be challenging. In this chapter, we offer ten (or so) things for you to consider when you choose a probiotic supplement, including understanding which bacteria are in the supplement and how to decipher often-confusing probiotics labels.

Genus, Species, and Strain

Bacteria are identified by their *genus* and *species*. The genus is the collection or group to which the bacteria belong; the species is the individual bacteria type.

Some bacteria also have several *strains*, or variations within the same species, and the strain appears at the end of the

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bacteria's formal name. For example, *Lactobacillus acidophilus DDS-1* belongs to the genus *Lactobacillus* and the species *acidophilus*. *DDS-1* is the specific strain.

When researchers study bacteria and probiotics, they typically study a single strain to determine whether that particular bacteria is useful for a certain health condition. Do your research online and talk to your doctor to find out which particular strains of bacteria have been successful in treating your health condition.

Multiple Bacteria

Your gut contains about 1,000 different types of bacteria. Because of the variety in your gut, it makes sense that your probiotic supplements should contain several strains. A good probiotic usually includes *Lactobacillus acidophilus*, *Bifidobacteria*, and at least two or three other bacteria.

Stability and Storage

Manufacturers use different *stabilizers* to prevent loss of bacteria during shipping and storage. Obviously, a well-formulated probiotic is one that is stable during shipping and storage.

Some probiotics may need to be refrigerated; check the label for storage instructions. Even if the package doesn't indicate refrigeration, always store probiotics in a cool place. Most probiotics are stable for several months if they're not exposed to heat and moisture. Research shows that moisture reduces live bacteria's lifespan.

Gastroenterologist Recommended

Check with your doctor to see if your probiotic meets with his or her approval. This step is important for two reasons. For one thing, your GI may have experience with other patients using probiotics and may recommend a specific one.

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More important, though, your symptoms may overlap with some of the more serious GI conditions such as colon cancer or inflammatory bowel disease. Your doctor may need to do some tests before you decide to take probiotics.

Acid Protection

Stomach acids attack and destroy many bacteria that enter your digestive system, whether they arrive in food or in a probiotic tablet. Good probiotics use technology to protect the bacteria from the stomach acids. The highest quality probiotics are tested in a "simulated gastric acid environment" to make sure the capsule survives the stomach environment.

Probulin is a good example of an acid-protected probiotic. Probulin is made with a proprietary process that minimizes the loss of bacteria to the harsh stomach acid: the probiotics aren't released until after the capsule leaves the stomach. *Super-Probiotic* uses a delayed-rupture technology that ensures the capsules don't release their contents until they're farther down the digestive tract (see Chapter 1).

Prebiotics Included

Prebiotics are food ingredients that your system uses to help live bacteria grow and prosper. Healthy bacteria must be well-nourished to survive, and prebiotics help in this process by feeding them. As a result, some probiotic companies are beginning to include prebiotics in their supplements.

The new generation of probiotics, like Probulin and Super Pro, include prebiotics.

Labeling Standards

Although the FDA regulates labeling for dietary supplements and reviews ingredients for safety (not effectiveness), the agency doesn't endorse or approve any dietary supplements. Several independent organizations — including ConsumerLab.com, NSF International (`www.nsf.org`), and U.S. Pharmacopeia (`www.usp.org`) — allow manufacturers to display their seals

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on their labels if they pass tests for quality, manufacturing processes, and other standards.

A good probiotic label should have the following:

- A list of all the bacteria contained in the product
- The number of CFUs, or colony-forming units, of the bacteria (the more CFUs the better — go for 1 to 10 billion)
- An expiration date or suggested final date for use
- Storage requirements (many suggest being cooled)
- A listing of any additional ingredients

Why Choose Probulin?

Probulin (`www.probulin.com`) is a "gourmet" probiotic because it includes multiple bacteria, including *Lactobacillus acidophilus DDS-1*, as well as the prebiotic inulin. Proprietary technology helps to ensure that the bacteria aren't released in (and therefore destroyed by) stomach acid.

Probulin is appropriate to use for general good health and for digestive problems.

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Why Choose Probulin?

1. Probulin is made with acid protection technology that minimizes the loss of bacteria due to harsh stomach acid.

2. Probulin is recommended by a prominent Gastroenterologist.

3. Probulin contains multiple bacteria, including Lactobacillus acidophilus DDS-1, one of the most researched strains of probiotics. In total, Probulin includes seven types of probiotic bacteria. More strains of bacteria are better than one. It is best if supplements include both Lactobacillus and Bifidobacter strains, as Probulin does.

4. Probulin uses the PREBIOTIC Inulin: a high-density plant-produced fiber. Prebiotics are food ingredients that help live bacteria grow and prosper. Probulin is the next generation in probiotics because it uses probiotics plus prebiotics to create a synbiotic.

The next generation in probiotics

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SAUERKRAUT | Cabbage fermented in brine, but must be raw to contain active cultures.

MISO | Fermented Japanese seasoning made from beans or grains.

PICKLES & OLIVES | Naturally contain probiotics only if not pasteurized.

TEMPEH | A source of vitamin B12, Tempeh is a fermented grain made from soybeans.

KIM CHI | Another cabbage dish, it is a spicy & sour form of pickled sauerkraut.

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- ANTI-AGING SERUMS | Fight wrinkles and signs of aging by using a daily facial serum.

Probiotic Tampons/ Vaginal Capsules

Fights recurring urinary tract infections and yeast infections.

Children's Chewable Probiotics

Kids can get the benefits of probiotics in simple, chewable probiotic capsules.

Pet Probiotics

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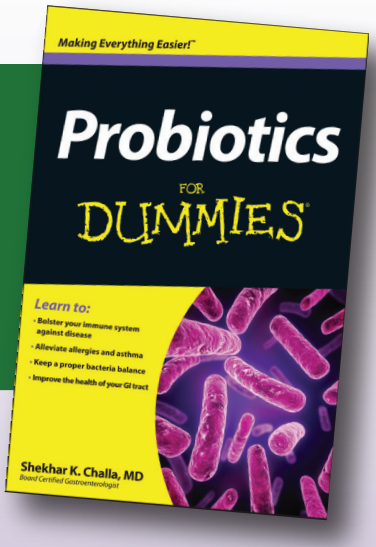
THE NEXT GENERATION IN PROBIOTICS

What's on the Horizon in the World of Probiotics?

Although this book gives basic information of what probiotics, prebiotics, and synbiotics can do for your digestive health, it's really a preview of where probiotics are headed.



Want More Information?

Look for the full version of *Probiotics For Dummies* available May 2012

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What's Included

- Expansion on probiotic, prebiotic and synbiotic research and studies.
- How probiotics can help boost immunity against various diseases.
- New and upcoming products in the probiotic industry.
- Includes a recipe chapter to help you get probiotics in your daily diet.

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Discover the health revitalizing benefits of probiotics and add balance to your overall health

Probiotics, beneficial live microorganisms that are similar to those found naturally in the human intestine, are often referred to as "friendly" or "good" bacteria. They are the cornerstone of any successful health program because they restore a healthy balance between friendly and bad bacteria in the intestinal tract — a balance that is critical for the health of the entire body. *Probiotics For Dummies* instructs you on how to ingest the right probiotics — in the form of food and supplements — as part of a total wellbeing program.

- ***Time to digest* — find out how the digestive system works; the role bacteria play; the importance of immune functions; and how probiotics can relieve digestive problems , restore balance, and tend to digestive disorders**
- ***To your health* — apply probiotics to health issues such as asthma and respiratory allergies, eczema, and food allergies**
- ***An ounce of prevention* — learn how probiotics may aid in the prevention of some forms of cancer; heart, kidney, and liver diseases; and autoimmune diseases**
- ***You are what you eat* — determine which foods are rich in probiotics and decide when and how to use probiotic supplements**

Open the book and find:

- **How probiotics can help fight aging**
- **The uses of probiotics to bolster the immune system**
- **The disease prevention promise of probiotics**
- **The ins and outs of choosing probiotic drinks and snacks**
- **Which supplements to look for and how and when to use them**

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