Chapter 1

Inflammation, Food, and You

In This Chapter

- Understanding how inflammation fits into the immune system
- Using nutrition to decrease inflammation
- Making lifestyle changes beyond the food you eat

If you ever fell off your bike or out of a tree, you're familiar with inflammation surrounding an injury. In most cases, inflammation surrounds minor cuts and bruises in the form of swelling and protects the injured area until it heals. Since the late 1980s, however, researchers have turned their attention to other causes of inflammation, such as diet and internal imbalances. These inflammatory responses may be so severe that they lead to chronic illness, such as diabetes, arthritis, heart disease, and cancer.

In this chapter, you get a better idea of just what inflammation is — both the good and the bad — as well as how it's defined and what to look for. Throughout the remainder of this book, you discover foods that may contribute to the problem as well as those foods, vitamins, and supplements that may lessen the effects of inflammation.

What Is Inflammation?

The first thing you need to know about inflammation is that it's not all bad. In fact, inflammation plays an important role in keeping you healthy. Inflammation is the body's way of protecting itself from harmful bacteria, viruses, and injury. In some cases, though, that system causes the body to turn on itself, attacking healthy cells and organs. In this section, we take a look at the various kinds of inflammation and identify how things can go wrong.

Understanding how the immune system responds

The *immune system* is a complicated association of organs, tissues, and cells that work together to protect the body. Inflammation is part of your body's response when it feels it's in danger of infection or further injury.

There are three kinds of immunity:

- **Passive:** *Passive immunity* is a temporary immunity that comes from another body, such as from the mother through the placenta or breast milk. Passive immunity typically disappears 6 to 12 months after birth.
- **Innate:** *Innate immunity* is the immunity you were born with. Innate immunity includes barriers that keep invaders from entering your body, as well as inflammatory responses — coughing; producing tears, sweat, mucus, and additional stomach acid; swelling; and so on.
- **Acquired:** *Acquired immunity* develops in the presence of certain antigens. It develops as your body builds defenses against specific invaders, such as viruses that cause chicken pox and the common cold.

In this section, we cover innate and acquired immunity, the two immune systems that stick around through adulthood. We discuss inflammation as part of the innate immune system, and we cover the invader-specific defenses of the acquired immune system.

Innate immunity: Providing general protection with inflammation

Inflammation is part of your body's innate response to invaders. The inflammatory response takes over when harmful bacteria, viruses, toxins, or other elements make their way into your tissues and cause damage. Those damaged cells release chemicals called prostaglandins and histamines, which cause blood vessels to leak fluid into the tissues and create swelling.

The resulting inflammation — characterized by redness, swelling, heat, and pain — serves as a physical barrier against the spread of infection (in the case of illness) or against further injury (which would delay the healing process). Chemical factors released during inflammation ward off or sensitize pain signals, creating a more suitable environment for healing.

Meanwhile, the immune system, sensing danger, sends backup. Various parts of the immune system respond by directing traffic, isolating and killing the invaders, and destroying and clearing out infected cells. The cells communicate with each other through a variety of chemical signals, including cytokines, C-reactive protein, acute-phase proteins, prostaglandins, and

more. Understanding this response is helpful for doctors because inflammatory markers indicate where the problem is and how severe it may be. Researchers examine the process to determine what triggers inflammation and find ways to control it — such as through diet — when things go wrong.

Acquired immunity: Attacking specific invaders from past encounters

The acquired, or adaptive, immune system is the one you develop based on what you do, where you go, and what you're exposed to. The more bugs and viruses you come in contact with, the more complex your acquired immune system becomes.

Through a process called *immune response,* the immune system calls upon its network — cells, tissues, and organs — to combat illness and infection. *Leukocytes*, or white blood cells, seek out and destroy infectious organisms and substances. There are two kinds of leukocytes:

- *Phagocytes,* which are the hungry leukocytes that eat the invaders
- *Lymphocytes,* which help the body identify and recognize attackers so it knows what to watch for later

Here's what happens: When your body detects antigens (the foreign substances), a group of cells get together and form a type of cell army to attack the invader. Some of these cells produce *antibodies* that can lock onto the specific antigens. The antibodies serve as tags, identifying the invader as an enemy and targeting it for destruction.

Some of the antibodies continue to live in your body so they can immediately attack if the same antigen is detected. The next time the antibodies encounter that antigen, they lock on and initiate an inflammatory response.

Seeing where inflammation goes wrong

When inflammation works right, it attacks the irritant — the virus, harmful bacteria, or damaged cells. Sometimes, however, the body kicks into overdrive and launches an offensive on normal, healthy tissue. For example, if you have the autoimmune disorder rheumatoid arthritis, you see some redness and some swelling in the joints, with joint pain and stiffness. This reaction is a sign that your body is trying to attack your joint tissue, which your body mistakenly perceives as unfriendly.

Say your house is being overtaken by mosquitoes. You get some mosquito spray, light a citronella candle, and keep a rolled-up newspaper handy. You're handling the irritant and the irritant only. Now say you've gone a little

bit overboard. Instead of a rolled-up newspaper, you take a baseball bat and try to kill that mosquito on the wall. The problem is that the mosquito wasn't a mosquito at all; it was just a shadow, and now you have a hole in the wall. In the same way, the immune system can overreact to perceived threats and damage the body.

The way your body responds to inflammation partially depends on your genetics and environmental factors. Most generally healthy people respond to a cut or bruise in the same way, but how the immune system responds to a virus, a bacteria, or different foods can differ from person to person. The differences in the way your immune system responds depends on the following:

- Your genes
- Your general state of health
- The health of major organs of immune function, such as the gastrointestinal tract
- Dietary influences on health, including nutrients and toxins in food
- Environmental toxins, such as pesticides
- Blood sugar and insulin dysregulation
- Stress factors (stress weakens the immune system)

A major underlying factor in the different ways people are affected by inflammation is an imbalance in their acquired immune systems. In a healthy immune system, the *helper T cells* (those that are part of the immune response and attack) are in balance — one cell to attack blood-borne parasites, the other to attack invaders such as bacteria. As the immune system becomes overstimulated, the helper cells find themselves in a self-perpetuating imbalance, causing the helper cells to attack the body. As long as whatever is causing the inflammation is still present, the imbalance remains.

Inflammation can also go on too long. The innate and the acquired immune systems communicate with each other through sensors and signals, which tell the body when to release certain chemicals and proteins to activate the inflammation guard. The signals are supposed to tell the inflammation when to stop as well. That doesn't always happen. Some people have elevated levels of C-reactive protein, an inflammatory marker that leaves the body in defensive mode, always ready to attack. When that happens, your body begins a steady downward spiral leading to disease.

Creating inflammation isn't something your body does without effort — it takes energy, which causes fatigue and creates *free radicals,* molecules that cause cell damage. Thanks to all the things you're exposed to, cells related to the inflammatory response have to become pretty strong, which means that when they attack, they do so with force. That force can cause damage the longer those cells are active.

Understanding the difference between acute and chronic inflammation

Inflammation may be acute or chronic. The biggest difference between the two is time:

- **Acute:** *Acute inflammation* occurs almost immediately after tissue damage and lasts for a short time, from a few seconds to several days. It's what causes bruising and swelling when you fall or sprain something.
- **Chronic:** Although usually not as painful as acute inflammation, *chronic inflammation* lasts much longer, sometimes for several months. Chronic inflammation can be caused by physical factors (viruses, bacteria, blood sugar imbalances, extreme heat or cold) or emotional factors (chronic daily stress). Over time, chronic inflammation can contribute to chronic disease by throwing off the body's immune system and creating a lot more inflammation in the process.

Some researchers describe inflammation as *high-grade* or *low-grade,* depending on the severity of inflammation and the levels of inflammatory markers such as C-reactive protein (CRP). Low-grade inflammation, especially chronic low-grade inflammation, tends to be the more dangerous form. Low-grade inflammation often leads to chronic disease, such as atherosclerosis (hardened arteries), diabetes, cancer, arthritis, multiple sclerosis, irritable bowel syndrome, high blood pressure, and lupus. Many of the factors leading to low-grade inflammation are lifestyle-related: smoking, stress, obesity, inactivity, and diet.

Low-grade inflammation often goes undetected, but here are common symptoms:

- Body aches and pains
- Fever
- Congestion
- Frequent infections
- Stiffness
- Dry eyes
- Diarrhea or irritable bowel syndrome symptoms
- Indigestion
- Shortness of breath
- Fatigue

One of the first and best ways to determine whether you're experiencing low-grade inflammation is to have some blood work done. A healthcare professional can test your *highly sensitive-CRP* (hs-CRP) levels. According to the American Heart Association, an hs-CRP test can help determine a person's risk for heart disease, stroke, and other cardiac issues.

Gut reactions: Linking food, digestion, and the immune system

For you to remain healthy, your immune system must remain healthy and in balance. Getting the right kinds and amounts of proteins, fats, vitamins, and other nutrients is key in getting and staying healthy. Eating right gives your body the building blocks it needs to build cells and create chemicals, and the digestive system plays a key role in the immune system.

Breaking down food and dealing with the pieces

Digestion involves mechanical actions — the chewing and grinding of the food — as well as chemical processes, in which enzymes break down the food into tiny molecules. Your body puts these molecules through a selection process, keeping the useful molecules as raw materials for building cells, hormones, and so on; filtering out what it can't use; and neutralizing and removing harmful substances.

Eating the right kinds of foods in the right amounts ensures that your body has the raw materials it needs. For example, eating the right kinds of fats can strengthen your immune system and help you fight off inflammation. *Eicosanoids,* which are chemicals involved in inflammation, are made from essential fatty acids. Eating the right types of these fats, like omega-3 fatty acids, will allow your body to produce anti-inflammatory eicosanoids, something that doesn't happen when you eat too many omega-6 fatty acids. We discuss fats in Chapter 5.

Recognizing the digestive tract as part of the immune system

A major forgotten part of the immune system is the digestive tract. In fact, 80 percent of your immune system is found there. The digestive tract contains the *gut associated lymphoid tissue* (GALT), a type of tissue that monitors and protects the body against pathogens (germs). There is a high concentration of GALT in the small intestine, where your food gets absorbed.

Due to *oral tolerance,* the GALT doesn't respond to most foods you eat as foreign invaders. That's why you don't mount an immune system response to everything you eat. However, the GALT is the same part of the immune system that overreacts to food and mediates the hyperreactive immune response in food allergies, where the food is seen as an invader.

The intestines also offer a safe haven for beneficial bacteria, which aid in digestion and occupy prime real estate so other, harmful microorganisms can't move in. *Dysbiosis* is an imbalance of good and bad bacteria in the gut. Because many of its symptoms seem to be normal reactions to some foods, many people shrug off the condition. But if left untreated, it can turn into leaky gut syndrome, a major cause of disease.

Leaky gut syndrome is part of the mechanism that contributes to inflammation in the gastrointestinal (GI) tract and thus the rest of the body. Inflammation in the intestines disrupts the *tight junctions,* the glue that holds the cells of the intestines together in a self-contained tube. Most molecules are too big to fit through these junctions, so the only way for them to escape the intestines and enter the blood is to be ferried through the intestinal cells, from one side to the other. With inflammation, the junctions become "leaky" and let things such as large food particles and bacteria out into the rest of the body, where the immune system can attack them (see Figure 1-1). In this way, leaky gut syndrome, also known as *intestinal hyperpermeability,* contributes to autoimmune disorders, joint pains, and food allergies and sensitivities.

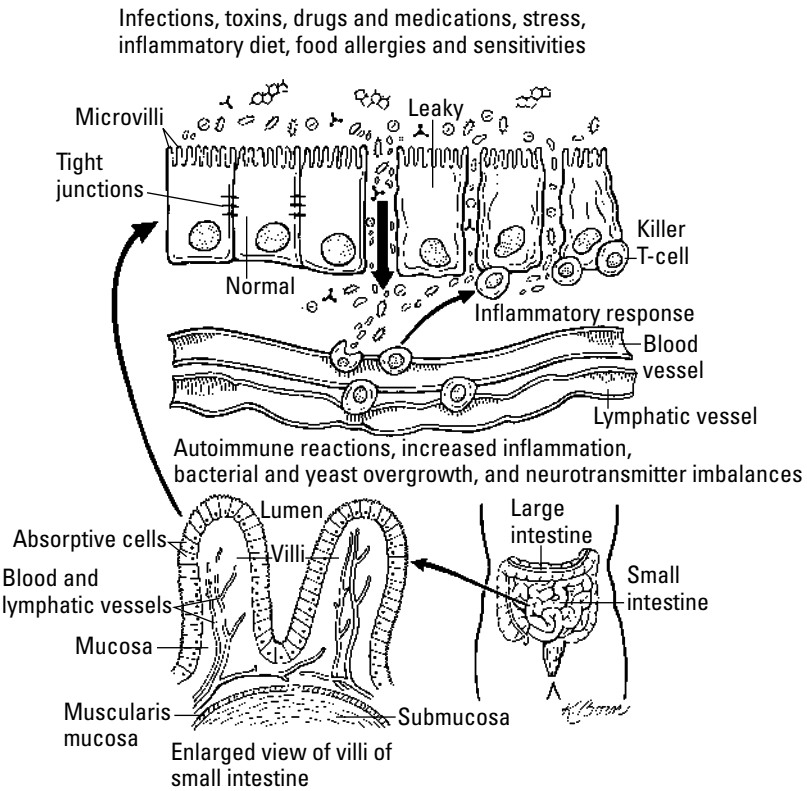

Figure 1-1: With leaky gut syndrome, large particles can escape the digestive tract.

Treating Your Symptoms with Nutrition

A lot of recent research has turned to the relationship between what people eat and how it affects their inflammation levels. Many foods common in most kitchens promote inflammation, and others have a noticeable diminishing effect on inflammation and may prevent it altogether.

In this section, we look at foods that can cause discomfort and how they're linked to inflammation. We tell you how to restructure your diet long-term to maintain good health and help you avoid sometimes-hidden internal inflammation.

Creating a diet that works for you

Creating an anti-inflammatory diet based on the foods your body accepts most helps you stay in good health while maintaining — or retaining — energy levels and ensuring you get an ample supply of vitamins and minerals.

Sometimes you may feel gassy or bloated or get a headache after eating, but have you ever stopped to think that it's a specific food that's causing those symptoms, and it very likely causes the same symptoms every time you eat it?

No one diet or menu works for everyone. Your needs are different from your neighbor's and different still from those of the person who lives down the street. If you're allergic to dairy products, it's a safe bet that foods made with cow's milk aren't going to top your list of foods to eat. People with celiac disease or gluten sensitivities aren't going to be eating a lot of breads or baked goods.

The first step in tailoring an anti-inflammatory diet is to determine which foods are good for *you* — which ones don't cause you pain, bloating, gas, or other feelings of discomfort. Read the list of toxic foods (see Chapter 2) to determine which foods to avoid and create a menu that helps your body and also tastes good.

Eating right for long-term benefits

Inflammatory foods can create instant symptoms as well as long-term effects. What's the damage in the long term? Inflammatory foods can speed the aging process, contribute to rheumatoid arthritis and other joint problems, and stimulate inflammation in a variety of ways (see Chapter 3).

Knowing which foods are inflammatory can be as simple as keeping one rule of thumb in mind: The less it looks like it did originally, the more inflammatory it likely is. Whole grains such as bulgur, brown rice, and oats all look like they do in the wild, complete with the germ and the entire grain kernel, so they're likely to be okay.

Whole, natural foods still contain many, if not all, of the vitamins and minerals they should have. Eating these foods is especially important for people with chronic diseases, genetic disorders, chronic stress, or metabolic disorders. These conditions increase the need for the vitamins and minerals that reduce inflammation and help the body work properly.

Splurging — or treating yourself — is okay now and then, but you should avoid certain inflammatory foods (see Chapter 4). Foods to avoid include high-omega-6 oils, such as those made from corn, safflower, sunflower, and cottonseed; inflammatory saturated fats from animal sources, as found in processed meats like bologna and hot dogs; trans fats; and refined sugars.

Striking the right nutritional balance is just as important as knowing which foods to eat. Make sure you're getting the right amount of proteins, healthy fats, vitamins and minerals, and other nutrients.

Supplementing Your Diet with an Anti-Inflammation Lifestyle

Creating an anti-inflammation diet is more than changing the foods you eat; it's committing to a change in lifestyle to give you a healthier life. Here are two areas of change that go hand-in-hand with the anti-inflammation diet:

- Restocking your kitchen with anti-inflammatory foods
- Relearning how to cook; if you're fond of deep-fried foods or even battered vegetables cooked in oil, get used to eating a little differently

Take a look at some of your habits or vices. Do you smoke? Drink? How much exercise do you get each day? Those are three big areas in which change — giving up smoking, reducing how much you drink, and increasing how much you exercise — can make a world of difference.

Physical activity helps with weight loss and maintenance, makes your heart work more efficiently, keeps your blood pressure in normal ranges, and reduces stress, a major factor in inflammation. Chronic stress depletes your body of the nutrients you need for your immune system to function properly. Get started with some meditation or yoga and take up a cardio workout to slow aging of the brain and build up your muscles and nerves. We discuss exercise and meditation in Chapter 19.