

# The New Science Behind America's Deadliest Diseases

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What do heart disease, diabetes, Alzheimer's, stroke and cancer have in common? Scientists have linked each of these to a condition known as chronic inflammation, and they are studying how high-fat foods and excess body weight may increase the risk for fatal disorders.

Inflammation is the body's natural response to injury and outside irritants. But when the irritants don't let up, because of a diet of high-fat foods, too much body fat and smoking, for example, the immune system can spiral out of control and increase the risk for disease. Experts say when inflammation becomes chronic it can damage heart valves and brain cells, trigger strokes, and promote resistance to insulin, which leads to diabetes. It also is associated with the development of cancer.

Much of the research on chronic inflammation has focused on fighting it with drugs, such as cholesterol-lowering statins for heart disease. A growing body of research is revealing how abdominal fat and an unhealthy diet can lead to inflammation. Some scientists are investigating how certain components in foods might help. Dietary fiber from whole grains, for instance, may play a protective role against inflammation, a recent study found. And dairy foods may help ease inflammation in patients with a combination of risk factors.

## Foods That Fight Inflammation

Scientists are studying how diet affects chronic inflammation in the body.



Researchers are investigating whether a diet rich in omega-3 fatty acids diminishes the production of inflammatory molecules and cuts the risk of colorectal cancers. Omega-3s are found in **salmon and other oily fish**, canola oil and flax seed.



Patients given 3½ servings of dairy a day had reduced inflammation and lower blood pressure, compared with a group getting half a serving, a study found. The researchers recommend **three daily servings of low-fat dairy** to help guard against inflammation.



Consuming more dietary fiber was associated **with lower levels of C-reactive protein, which signals inflammation**, a new study found. Dietary fiber also helps prevent insulin resistance, which can lead to diabetes, researchers said.

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Chronic inflammation is perhaps best understood in its relation to cardiovascular disease. The immune system's white blood cells rush to the arteries when the blood vessels are besieged by low density lipoprotein, or LDL—the "bad" cholesterol. The cells embed themselves in the artery wall and gobble up the invading cholesterol, causing damage to the arteries that can lead to heart attack or stroke.

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"You need to have inflammation when you have a wound and the immune system goes in to heal it. Yet we don't want too much inflammation in our system causing damage to our arteries" and other harm, says Wendy Weber, a program director at the National Center for Complementary and Alternative Medicine, part of the National Institutes of Health.

One significant discovery concerns obesity and the ways it promotes inflammation. Fat cells, particularly those in the visceral fat that settles in the belly and around organs, were long thought merely to store excess weight. Instead, fat cells act like small factories to churn out molecules known as cytokines, which set inflammation in motion, says Peter Libby, chief of the division of cardiovascular medicine at Brigham and Women's Hospital in Boston and a professor at Harvard Medical School.

"We've learned that abdominal fat tissue is a hotbed of inflammation that pours out all kinds of inflammatory molecules," Dr. Libby says. The most important step patients can take is to lose excess weight, which can reduce inflammation in a matter of weeks or months, he says.

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## 2.2 Pounds

Losing this much weight reduced C-reactive protein, an inflammation measure, by 0.13 mg/L, a study found. Experts say CRP below 1 mg/L indicates low risk of cardiovascular disease, while above 3 mg/L is high risk.

A substance known as C-reactive protein, measured with a simple blood test, is an indicator of inflammation in the body. A report published in Archives of Internal Medicine in 2007, which analyzed results of 33 separate studies, found that losing weight can lower C-reactive protein levels. For each one kilogram, or 2.2 pounds, of weight loss, whether by dieting, exercise or surgery, the mean reduction in C-reactive protein among participants was 0.13 milligram per liter.

According to the American Heart Association, a C-reactive protein level of less than 1 mg/L indicates a low risk of cardiovascular disease, 1 to 3 mg/L indicates moderate risk, and greater than 3 mg/L equals high risk. Doctors increasingly are ordering the test for patients at moderate risk for heart disease.

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At a meeting in Quebec City last week on abdominal obesity and its health risks, experts in cardiology, endocrinology, nutrition and related specialties presented a wide range of new research linking obesity to inflammation-related diseases.

A number of nutritionists and physicians have developed anti-inflammatory diets. Christopher Cannon, a Harvard professor of medicine, co-wrote "The Complete Idiot's Guide to the Anti-Inflammation Diet." Dr. Cannon says his recommended diet is based on both the Mediterranean diet and a Healthy Eating Pyramid developed at Harvard University. This encourages consuming whole-grain foods, unsaturated fats such as plant oils, fruits, vegetables, nuts, fish, poultry, eggs and moderate amounts of dairy foods. It also suggests avoiding as much as possible red meat, butter, sweets and white foods such as rice, potatoes and pasta.

Still, there is little evidence to support any specific diet to protect against inflammation, says Dr. Cannon. "If you weigh 300 pounds and eat healthy, the weight will still counter any beneficial foods you are eating," Dr. Cannon says.

The American Heart Association recommends consuming both omega-3 fatty acids, found in cold-water fish like salmon and canola oil, and omega-6 fatty acids, found in nuts, seeds and vegetable oils such as corn oil. But investigators are still studying the roles each may play in promoting or controlling inflammation.

In one study, researchers at Vanderbilt University are focusing on whether omega-3 fatty acids reduce the risk of colorectal cancers and diminish the production of inflammatory molecules. Principal investigator Harvey Murff says many Americans consume far more omega-6 fatty acids, and one aim is to determine a healthy balance of omega-3 and omega-6 fatty acids.

Greater dietary fiber consumption was associated with lower levels of C-reactive protein and other markers in the blood that signal inflammation, according to a new study involving nearly 600 adolescents published in the *Journal of Clinical Endocrinology and Metabolism*. Norman Pollock, a researcher at Georgia Health Sciences University and a co-author of the study, says one explanation may be that fiber is associated with higher levels of a protein hormone that improves insulin sensitivity, which in turn lowers levels of inflammation.

A combination of nutrients found in dairy food may also help ease inflammation in patients at risk for heart disease, stroke and diabetes. In a 40-patient study published last year in the *American Journal of Clinical Nutrition*, patients who were given 3½ servings of dairy daily over 12 weeks showed reductions in several markers of inflammation compared with a group given just half a serving of dairy per day. The first group also showed reduced blood pressure. Michael Zemel, a co-author of the study and professor emeritus at the University of Tennessee's Department of Nutrition, says three daily servings of dairy containing whey and its nutrients could help guard against inflammation. He recommends low-fat milk or yogurt.

New research funded by the National Institutes of Health is looking at the relationship of diet, inflammation and cancer.

"Cancer is caused by many different processes and inflammation is one of them, and if you could inhibit that process it would be tremendously helpful," says Young S. Kim, program director in the Nutritional Science Research Group at the National Cancer Institute.