



Inflammation – A Biological Response to Stress

In the past decade, inflammation has become one of the hottest topics in medical research because it is emerging as a possible cause of many of the chronic diseases that threaten the quality and the length of life. . If that's true, then addressing inflammation could be a singular approach to targeting multiple health conditions and, perhaps, could simplify scientific and medical research strategies for fighting many of the most deadly chronic diseases.

We now know that there are many possible lifestyle and environmental triggers of inflammatory stress, including smoking; a high-fat, high-carbohydrate diet; obesity; radiation; and even exposure to environmental toxins. Persistent, chronic, or uncontrolled low-grade inflammation has been linked to increased risk for the metabolic syndrome and heart disease, diabetes and insulin resistance, rheumatoid arthritis, certain cancers, asthma, allergies, and even Alzheimer's disease.

Acute inflammation is a natural immune system response to injury or infection during which the body orchestrates a symphony of immune system signals, messages, and physiological actions to combat and neutralize foreign invaders that may be responsible for the injury. This inflammatory response can result in the characteristic redness, heat, swelling, and pain that you may see and feel at the site of a wound and is the beginning of the healing process as the body eventually brings nourishment to the site.

Most of the time, inflammation is an acute, on-demand function, a *biological stress response* that enables our body to fight off disease-causing bacteria, viruses, and parasites. But when inflammation doesn't shut down on cue, or somehow persists with no particular purpose, it can attack normally healthy cells and cause damage at the cellular level. In autoimmune diseases, a continuously triggered inflammatory response causes damage to its own tissues—sometimes with disastrous health consequences

Recent research has uncovered the benefits of smoking cessation and even moderate exercise as sound approaches to battling inflammatory stress. A September 2010 laboratory study found that a three-week moderate exercise regimen reduced several biomarkers of inflammatory stress, including C-reactive protein (CRP) in diabetic rats, (onlinelibrary.wiley.com/doi/10.1111/j.1365-2249.2010.04240.x/abstract). The investigators concluded that moderate physical exercise had significant anti-inflammatory effects and that this may be a good strategy to protect against insulin resistance and vascular complications in diabetics.

Nutritional approaches to reducing inflammatory stress are also receiving more attention. Several studies have supported the benefits of a "Mediterranean" or an "anti-inflammatory" type diet, and spices such as ginger and turmeric are also showing promise. In the 2010 review *Dietary polyphenols can modulate the intestinal inflammatory response*, plant sources of dietary polyphenols—including green tea extract, various flavonoids, ellagic acid (found in muscadine grapes and pomegranates), and resveratrol (found in red wine and Japanese knotweed)—were shown to successfully modulate intestinal inflammatory response. The investigators concluded that the use of natural preventive treatments in early life could reduce or delay inflammatory bowel diseases, and that polyphenols could play an important role in modulating intestinal inflammation (onlinelibrary.wiley.com/doi/10.1111/j.1753-4887.2009.00210.x/abstract).

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In February 2011, a new study, *A resveratrol and polyphenol preparation suppresses oxidative and inflammatory stress response to a high-fat, high-carbohydrate meal*, was published online in the *Journal of Clinical Endocrinology and Metabolism*. The researchers from the State University of New York at Buffalo (SUNY) showed that a resveratrol and muscadine grape polyphenol blend was able to suppress the oxidative and inflammatory stress response typically experienced after consumption of a high-fat fast food meal (jcem.endojournals.org/cgi/content/abstract/jc.2010-1812v1).

This peer-reviewed and published human study is even more compelling because it is one of the earliest placebo-controlled clinical research studies on resveratrol compounds. In fact, a January 2011 review of resveratrol research published in the *Annals of the New York Academy of Sciences* found only six recently completed clinical trials on resveratrol supplementation, and only one other study employed a placebo-controlled design (onlinelibrary.wiley.com/doi/10.1111/j.1749-6632.2010.05853.x/abstract).

In the SUNY study, the researchers fed 10 healthy adults either the resveratrol-muscadine polyphenol blend or a placebo before the high-fat fast food meal, and markers of oxidative and inflammatory stress were measured for five hours following the meal. In the group consuming the polyphenol blend, there was a significant reduction in the oxidative stress response typically observed after consumption of a high-fat meal. At three hours, there was also a 150% increase in Nrf-2, an important regulator of the body's antioxidant defense and detoxification systems.

The investigators also reported a significant blunting of the body's inflammatory response to eating a high-fat fast food meal in the subjects who consumed the resveratrol-muscadine polyphenol blend. Induction of two well-known inflammatory biomarkers, plasma lipopolysaccharide and IL-1 β , were both significantly reduced after consuming the high-fat meal, but only in the supplement group.

So what are we to do to address the chronic low-grade inflammation that permeates our modern-day lifestyles? Fortunately, many of the same dietary and lifestyle behaviors we've recommended for decades to lower the risk for cardiovascular diseases and cancer can also help to reduce the risk for chronic inflammation:

- Find an exercise you like and participate on a regular basis
- Reduce stress and keep your blood pressure in check
- Achieve and maintain a healthy weight, which can reduce inflammation, a biological stress response
- Don't smoke and avoid secondhand smoke
- Eat a healthful diet rich in plant foods, whole grains, legumes, leafy vegetables, colorful fruits, lean cuts of meats and poultry, and low-fat dairy products
- Choose unprocessed foods low in trans fats, saturated fat, salt, and sugar
- Seek out anti-inflammatory foods such as fish that are rich in omega-3 fatty acids, as well as olive oil
- Look for anti-inflammatory nutritional ingredients such as resveratrol, muscadine, and pomegranate polyphenols, as well as spices such as ginger and turmeric

For information about inflammation and your health, talk with your doctor or health care professional to discuss the steps you can take maximize your anti-inflammatory diet and lifestyle.

To your good health!

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