

The Link Between **Diet** & **Arterial Health**

It Isn't Just About Elevated Cholesterol Levels

With each powerful contraction, the human heart forces a strong wave of blood into the arteries. The blood presses against the vessel walls, which stretch and flex against the force, smoothing out the flow and moving it along.

Many Americans believe that eating too much cholesterol leads to plaque buildup in the artery walls, blocking that flow and increasing the risk of heart attack and stroke. Unfortunately, this is untrue. Only one-half of all heart attack and stroke victims have elevated cholesterol levels,¹ as there are many other factors that contribute to the development of cardiovascular disease (CVD). The good news is a nutritious diet can help maintain a clear, flexible, healthy circulatory system.

Healthy Circulatory System

When the circulatory system is functioning normally, the heart sends blood to the lungs to collect oxygen and then circulates that oxygen- and nutrient-rich blood to all cells in the body. Arteries carry blood away from the heart to the lungs, brain, or the rest of the body, and veins bring it back.²

Arteries and veins are lined with endothelial cells, which keep those blood vessels flexible, supple, and strong. This vascular endothelium (lining of blood vessels) controls vasodilation (widening of blood vessels) and vasoconstriction (narrowing of blood vessels). It's also in charge of mounting an immune response and repairing any damage to blood vessels.²

Unhealthy Circulatory System

Physicians have long been aware that arteries thicken and harden as we age as a result of plaque buildup. Traditionally, this process, called atherosclerosis, was treated by placing stents in blocked arteries to hold them open, removing the narrowed sections through bypass surgery, or using statins to lower LDL cholesterol to slow plaque buildup.

"There was an awakening in the cardiology world several years ago," says David Becker, MD, a cardiologist with Chestnut Hill Temple Cardiology in Philadelphia and originator of Healthy

Change of Heart, a lifestyle intervention program for individuals who have high cholesterol or are concerned about heart health. "Plaque is not just about LDL cholesterol; it's a multifactorial process. In fact, the presence of elevated LDL cholesterol levels only explains about half of all acute cardiovascular events."

According to Becker, physicians used to think that plaque built up over a lifetime like rings on a tree. They now know that irritation of the vascular endothelium causes plaque to grow. When the endothelium is irritated or damaged, it mounts an immune response to fix the problem. It's this immune response that ultimately leads to plaque development.

It's possible for plaque to remain stable, but if an area where plaque has developed continues to be irritated, the plaque can rupture. "If the plaque becomes irritated by inflammation, a scab or clot will form," Becker says. "That's when you need emergency intervention."

The clot can completely block an artery and cause a heart attack or stroke. "Inflammation is as important, or more important, than factors like cholesterol level in the development of cardiovascular disease," Becker adds.

Inflammation and Risk Factors

Anything that damages the artery walls or otherwise causes inflammation is a risk factor for CVD. Tobacco smoke is an example of a toxin that irritates the lining of blood vessels, triggering plaque formation. LDL cholesterol particles are part of the makeup of plaque, but their presence in the blood also causes inflammation. (HDL cholesterol, on the other hand, helps prevent inflammation.)

High blood pressure damages the arteries in another way: The increase in pressure overstretches the artery walls, leading to small tears that scar over with plaque. Even systemic inflammation caused by stress, lack of sleep, inflammatory disease, or obesity affects the arterial lining. High blood sugar and high triglyceride levels also contribute to inflammation.^{3,4} Controlling these risk factors with diet and other lifestyle changes can decrease the risk of heart attack and stroke.

By Judith C. Thalheimer, RD, LDN





Dietary Impact

Diet can be a powerful tool in protecting the lining of the arteries from damage. The ideal diet for healthy arteries minimizes harmful factors such as high LDL cholesterol and elevated blood sugar, blood pressure, and triglycerides, and maximizes factors that increase HDL cholesterol, support vasodilation and arterial elasticity, discourage clotting, and reduce oxidative stress to keep the vascular endothelium healthy.

Plenty of information is available on what not to eat, as saturated fat, trans fat, cholesterol, sodium, and added sugars clearly are associated with clogged arteries. Research now is focusing on what food components may positively impact arteries, including the following:

- **Unsaturated fats** can help reduce LDL cholesterol levels when eaten in moderation in place of saturated or trans fats. They're mainly found in fish such as salmon, trout, and herring; avocados; olives; walnuts; and liquid vegetable oils such as soybean, corn, safflower, canola, olive, and sunflower.⁵

Omega-3 fatty acids have been the focus of much research. These polyunsaturated fats are found in fish but also in plant foods such as flaxseeds, Chinese broccoli, and wheat germ and are thought to make the vascular endothelium healthier and stronger and also improve vasodilation.⁶⁻⁸

- **Antioxidants**, which are abundant in plant foods, reduce LDL oxidation, which helps lower inflammation and prevent plaque buildup.⁷

Flavonoid antioxidants such as those found in cocoa and red wine decrease inflammation, boost HDL cholesterol levels, and stimulate nitric oxide production. Nitric oxide, a key trigger of vasodilation, helps lower blood pressure and reduce blood clotting.⁷

Vitamin C is an antioxidant that's converted in the body to collagen and elastin that help keep blood vessel walls flexible and strong.⁹ Besides its powerful antioxidant action, vitamin E promotes healthy circulation by keeping platelets from sticking together and forming clots.⁹

- **B vitamins** such as B₆, B₁₂, and folic acid (folate) help break down homocysteine in the body. According to the American Heart Association (AHA), evidence suggests that homocysteine damages the vascular endothelium, promoting atherosclerosis, and that high serum levels of homocysteine have been associated with a greater risk of coronary heart disease, stroke, and peripheral vascular disease. It should be noted, however, that a causal link hasn't been established, and currently the AHA doesn't recognize high homocysteine levels as a risk factor for CVD.¹⁰

- **Arginine** is an amino acid found in plant and animal proteins. Especially abundant in nuts and legumes such as lentils, the form L-arginine is a precursor of nitric oxide, which may help keep blood vessels dilated and improve blood flow.² However, results of studies on L-arginine supplementation have been inconsistent.¹¹

- **Fiber-rich foods** (eg, whole grains, fruits, vegetables, legumes, nuts, seeds) are high in many of the beneficial components listed above, but fiber itself can help lower LDL cholesterol levels, support weight-loss efforts, and control blood sugar.

The food and beverage industries are seeking to capitalize on the possible cardiovascular benefits of individual food components by adding omega-3s, olive polyphenols, cocoa flavanols, and chitin-glucan fiber, an insoluble fiber derived from the cell walls of the mycelium of *Aspergillus niger*, to processed foods.¹

Role of Dietary Patterns

Eating less saturated and trans fats, cholesterol, sugar, and sodium and more omega-3 fatty acids, fiber, and antioxidants can be beneficial, but simply adjusting the intake of these particular components isn't the answer, says Alice H. Lichtenstein, DSc, director and senior scientist at the Cardiovascular Nutrition Laboratory at Tufts University and a spokesperson for the AHA. "When someone decreases their intake of one food, most people compensate by automatically increasing their intake of another. If there's a biologic effect, we don't know whether it's due to the lack of the one food or the substitution of the other," she says. "When individual nutrients have been studied to decrease CVD risk, for the most part, the results have been null, and in some cases concern has been raised when very high levels of single nutrients were used."

While the media and food companies tend to focus on individual components of food, "there tends to be too much focus on single nutrients. We need to get away from trying to assign an effect to an individual food or nutrient and think in terms of dietary patterns," she adds.

The 2013 AHA/American College of Cardiology (ACC) Guideline on Lifestyle Management to Reduce Cardiovascular Risk recommends a dietary pattern of fruits, vegetables, whole grains, low-fat dairy products, poultry, fish, and nuts with limited red meat and foods and beverages high in sugar.¹² This dietary pattern supplies plenty of arterial health-boosting nutrients without adding any special foods or supplements. "Most people will lower their blood pressure by restricting salt and getting enough potassium," Lichtenstein explains. "Getting adequate potassium happens automatically when we eat more fruits and vegetables."

And the benefits of a healthful dietary pattern go beyond a single nutrient. "Sure, a fiber-rich diet may have some impact on lowering LDL cholesterol levels, but you also get other benefits when you eat fiber-rich foods like fruits, vegetables, legumes, nuts, and whole grains such as essential nutrients and healthful fats," Lichtenstein notes.

Putting It Into Practice

Patti Morris, RDN, CDE, is an independent contractor who works with cardiology patients in Philadelphia and is the nutrition educator for Healthy Change of Heart. She recommends a modified Mediterranean-style eating pattern in line with the AHA/ACC guideline to her clients and avoids advocating for specific food components. "People get confused when they hear they should eat more antioxidants," she says. "I just tell them to eat more fruits and vegetables. They all have antioxidants."

To increase fruit and vegetable intake, Morris encourages her clients to aim for 3 cups of vegetables and two pieces of



fruit every day and to eat as many colors as possible. "I find it helps to give them good/better/best scenarios," she explains. "It's reassuring to them to know they don't have to do everything right all the time. Any change is a good change."

Since her patients already have heart disease, Morris recommends chicken, turkey, and fish almost exclusively, eliminating or at least cutting back on egg yolks and focusing on the quantity and type of fat in the diet, emphasizing mono- and polyunsaturated fats in place of saturated fat. "I also strongly recommend eating beans. They're like a magic food: high in fiber, filling, and they help stabilize blood sugar," she adds.

Alissa Rumsey, RD, CDN, CNSC, CSCS, a dietitian, personal trainer, and spokesperson for the Academy of Nutrition and Dietetics, recommends a similar dietary pattern with more mono- and polyunsaturated fats from foods such as olive oil and avocados, nuts, seeds, omega-3 fats from fish, and plenty of fruits and veggies. "All the food components that help keep arteries healthy are in these foods," she says.

She encourages clients to fill at least one-half of their plates with brightly colored vegetables at lunch and dinner. "I give them specific ideas for adding beneficial foods to their diets, like using avocado slices on a sandwich instead of mayonnaise, stirring walnuts into oatmeal, or sprinkling almonds over a couscous with veggies."

However, just following a healthful dietary pattern isn't the whole answer. "You have to look at this in the context of energy balance," Lichtenstein cautions. "You can eat the best heart-healthy, nutrient-rich diet, but if you take in an excess of energy, you're not likely to see the benefit." Obesity goes hand in hand with artery-damaging conditions such as high blood pressure, high cholesterol, and diabetes, and it's associated with a general rise in inflammation.

Morris counsels overweight clients to lose weight. "You don't have to get back to your high school weight," she explains. "Any loss is good."

To encourage moderation, Morris suggests decreasing fat intake and talks to her clients about portion control using food models to demonstrate appropriate portion sizes.

Rumsey advocates watching sugar consumption. "People don't realize all the hidden names for sugar: evaporated cane juice, fruit juice concentrate, and dextrose [for example]. Excess sugar can cause inflammation in the body, and it adds to the overall excess of calories that leads to weight gain."

Insulin resistance makes losing weight difficult, so Morris advocates patience. "Clients with fasting blood glucose over 100 may not lose weight right away, but I reassure them that if they stick with it, the weight will start to come off. It helps them to know I've seen it work," she says.

Other Lifestyle Changes

Nonetheless, achieving optimal arterial health requires more than just eating healthfully and managing weight. "It's important for dietitians to help clients make other lifestyle changes," Rumsey says. Quitting smoking, getting enough

sleep, reducing stress, and increasing physical activity are all essential to maintaining healthy arteries.

Rumsey offers tips for including these topics in nutrition counseling sessions: "Try to have clients pencil in at least 10 or 15 minutes of relaxation time each day, even if it's just turning off their computer monitor and taking deep breaths at their desk. I like meditation for stress release, but reading, walking, or taking a bath can all help them leave the world behind."

Rumsey also emphasizes sleep to keep inflammation in check. "Lots of research has shown that less than six hours of sleep can result in more inflammation," she says. "Older adults that already have high blood pressure and then don't get enough sleep increase their risk of heart attack dramatically. I encourage clients to get seven or eight hours a night."

Increasing physical activity is particularly important, as regular physical exercise is associated with improvements in blood pressure, decreases in LDL cholesterol levels, increases in HDL cholesterol levels, and improved glucose metabolism and body weight, and it promotes an antioxidant state that helps keep the vascular endothelium healthy.⁷ "How active you are correlates to how long you live," Becker says. "The more active you are, the less likely you are to have a cardiac event."

Rumsey encourages her clients to track their physical activity along with food intake. "There are a lot of great apps and technologies out there now," she says. "Some of them can even automatically share data with me."

Bottom Line

Healthy arteries are key to preventing heart attack and stroke. Limiting irritation of the arterial lining reduces plaque buildup, keeping arteries open and flexible.

A healthful dietary pattern can have a big impact on reducing inflammation. Following a diet rich in fruits, vegetables, whole grains, low-fat dairy products, poultry, fish, and nuts with limited red meat and foods and beverages high in sugar ensures an intake of several inflammation-fighting nutrients and minimizes plaque-promoting factors such as saturated fat. Other lifestyle changes go hand in hand with diet to keep inflammation in check.

According to Becker, a healthful lifestyle does prevent CVD. "Less than 3% of Americans eat a good diet, exercise regularly, are not overweight, and don't smoke," he says. "But these people have a very low risk of heart attack and stroke." Dietitians can help more people make the lifestyle changes necessary to keep their arteries healthy for a lifetime.

— Judith C. Thalheimer, RD, LDN, is a freelance nutrition writer, a community educator, and the principle of JTRD Nutrition Education Services.



For references, view this article on our website at www.TodaysDietitian.com.