

The Skinny on Food and Cholesterol

By Christina Fitzgerald, M.S., R.D., L.D.N., Contributing Editor

Our food mantras around fat and cholesterol have changed dramatically over the past decade. When medical professionals supported “low fat, low cholesterol” as the way to heart health, food scientists quickly reformulated their products. But, as Americans attempt to cut more fat and cholesterol out of the diet, waistlines keep increasing, as does the rate of heart disease. It is estimated that, in 2009, 785,000 Americans will have a new coronary attack, 470,000 will have a recurrent attack, and 195,000 will have their first heart attack (*Free Radical Biology & Medicine*, 2007; 43:1,374-6).

Blood lipids rising

What is causing this rise in blood lipids? The first study to make a connection between saturated fatty acid (SFA) intake and coronary heart disease (CHD) was “The Seven Countries Study.” This study demonstrated that a population’s intake of SFA was strongly correlated with serum cholesterol levels in the population; countries consuming more than 15% of total calories from SFA had the highest CHD mortality. SFAs elevate blood cholesterol with a dose-response between the SFA and LDL-C, with the most hypercholesterolemic SFAs being lauric (C12:0), myristic (C14:0) and palmitic (C16:0) acids.

Fat-free, low-fat, *trans*-fat free. After having these phrases thrown at them, no wonder it’s hard for consumers to swallow the new recommendations to enjoy healthy fats. But research has come a significant distance over the last decade regarding dietary fats and heart health. In 2006, the “Women’s Health Initiative Dietary Modification Trial,” published in *Journal of the American Medical Association* (2006; 295(6):655-666), demonstrated virtually identical rates of heart attack, stroke and other forms of cardiovascular disease in women who followed a low-fat diet and in those women who didn’t. The Nurses’ Health Study, which supported the same conclusions, also found that replacing 80 calories of carbohydrates with 80 calories of either polyunsaturated or monounsaturated fats lowered the risk for heart disease by about 30% to 40%, while replacing just 30 calories of carbohydrates (7 grams) every day with 30 calories of *trans* fats (4 grams) nearly doubled the risk for heart disease.

Consuming just 3% of daily caloric needs from *trans* fatty acids (TFA) will raise low-density lipoprotein (LDL) levels, and consuming 6% of daily needs from TFA will additionally lower HDL cholesterol levels. With this research, the American Heart Association, Dallas, continues to recommend total fat intakes at less than 30% of

FDA "Hearts" Health

FDA has approved several health claims for ingredients that support heart health.

- *For products and supplements that contain esterified or free forms of phytosterols: “Diets low in saturated fat and cholesterol that include at least 1.3 grams of plant sterol esters or 3.4 grams of plant stanols esters, consumed in two meals with other foods, may reduce the risk of heart disease.”*
- *Soy protein garnered the following: “25 grams of soy protein per day, as part of a diet low in saturated fat and cholesterol, may reduce the risk of heart disease.”*
- *In 1997, oats boosted the star power of fiber with this FDA health claim: “Three grams of soluble fiber from oatmeal daily in a diet low in saturated fat and cholesterol may reduce the risk of heart disease.”*
- *FDA also approved a qualified health claim for nuts: “Scientific evidence suggests, but does not prove, that eating 1.5 oz. per day of most nuts, such as [name of specific nut], as part of a diet low in saturated fat and cholesterol, may reduce the risk of heart disease.” Nuts able to make this claim include almonds, hazelnuts, peanuts, pecans, some pine nuts, pistachios and walnuts.*

total daily calories, while the National Heart, Lung and Blood Institute, Bethesda, MD, recommends that total fat intake comprise 25% to 35% of total energy, with less than 7% coming from saturated fat.

Consuming cholesterol

As studies discovered that high cholesterol levels are associated with heart disease, health professionals began encouraging their patients to eliminate or drastically reduce their intake of dietary cholesterol. However, many studies show a weak relationship between a person's dietary intake of cholesterol and their serum cholesterol level. Most people, on average, produce more cholesterol in their body than actually absorbed from dietary cholesterol. There is, however, a small percentage of the population that does experience a strong rise and fall in their serum cholesterol in direct response to their dietary cholesterol intake. Unfortunately, there is no way to identify this population, except by trial and error. This causes health professionals to continue recommending, as a healthy precaution, that the general public limit their daily consumption of cholesterol.

Even by following a low-cholesterol diet, there are a couple groups of people who are genetically predisposed to high cholesterol. Two specific groups include those with familial dyslipidemia and familial hypercholesterolemia (also known as FH, type IIa, or high LDL cholesterol, normal triglyceride). Those with familial dyslipidemia have a combination of a high triglyceride level (in at least two family members) and low levels of high-density lipoprotein (HDL) cholesterol. Approximately 15% of patients with CHD have familial dyslipidemia. Additional risk factors in this group include android obesity, insulin resistance, type 2 diabetes and hypertension. In FH, the LDL receptors are either absent or nonfunctional, resulting in hypercholesterolemia (usually greater than 300 mg/dL). FH accounts for 2% of CHD occurring before the age of 60.

Plant sterols and stanols

Sterols are an essential constituent of cell membranes in animals and plants. Cholesterol is the sterol found in human cells, while phytosterols are produced by plants. Although they have a similar chemical makeup to cholesterol, phytosterols contain a methyl or ethyl group in the side chain that causes them to be poorly absorbed by the intestines. Sterols are naturally found in small quantities in fruits, vegetables, nuts, seeds, cereals, legumes and vegetable oils. Stanols are found in the same foods but in much smaller quantities. Over 40 plant sterols have been identified, with β -sitosterol, stigmasterol and campesterol being the most abundant. Phytosterols may help lower LDL cholesterol levels by as much as 15%, according to some studies, by competing with cholesterol in the digestive tract and blocking absorption, so less cholesterol is then absorbed by the body and sent to the liver. According to a statement by the Nutrition Committee of the Council on Nutrition, Physical Activity and Metabolism of the American Heart Association, few adverse effects related to either the short-term or long-term consumption of the plant stanol/sterol ester-containing fats have been reported. However, there have been observations of decreased levels of plasma Alpha-plus beta-carotene, alpha-tocopherol and/or lycopene as a result of the consumption of foods containing both stanol and sterol esters. Because of potential adverse effects on fat-soluble nutrient levels—until further long-term studies are performed—the committee recommends that these products should only be consumed by adults who require lowering of total and LDL cholesterol levels, or for secondary prevention after an atherosclerotic event.

Science of soy

Soy has been vastly researched for its heart-health effects. A 1995 meta-analysis of 38 studies concluded that soy protein reduced low-density lipoprotein cholesterol (LDLC) by approximately 13%, independent of the fatty-acid content of the soyfoods. In addition to a healthy diet, a daily intake of 25 grams of soy, with intact isoflavones, has been suggested to lower LDL cholesterol by 4% to 8% in hypercholesterolemic persons.

More-recent meta-analyses have concluded that this figure might be closer to 3% to 5% LDL reductions, but this still could reduce risk of heart disease by up to 10%. Soy protein might also increase “good” high-density-lipoprotein (HDL) cholesterol by 1% to 3% and decreases triglyceride levels by 5% to 10%.

The mechanism by which soy protein reduces cholesterol has been a hot topic among investigators. Some theorize that cholesterol is lowered due to the displacement of higher-fat and higher-cholesterol foods for soy products. Some research points to peptides formed after soy protein digestion that might data suggest that regulate hepatic LDLC receptors. Other theories suggest that isoflavones in soybeans create the cholesterol-lowering effects.

Fiber effects

There are two main theories behind why fiber may help reduce cholesterol levels. First, it's thought that viscous soluble fiber, beta glucans, increase bile acid excretion, which in turn increases bile acid synthesis and reduces circulating levels of cholesterol. The second theory is that the bacteria in the colon ferment the fiber to produce acetate, propionate and butyrate, which inhibits cholesterol synthesis.

Despite which theory is the reality, studies show that soluble fibers (pectins, gums, mucilages, algal polysaccharides and some hemicelluloses) in legumes, oats, fruits and psyllium lower serum cholesterol and LDL cholesterol. However, the quantity needed to achieve results differs, depending on the food source.

Rice bran fiber is an additional component that has been looked at by investigators. A study published by the *American Journal of Clinical Nutrition* (2005; 81(1):64-68) specifically focused on defatted rice bran vs. rice bran oil to determine the component that has lipid-lowering effects. The results showed that defatted rice bran did not lower lipid concentrations, while a rice bran oil diet decreased LDL cholesterol by 7%, leaving HDL cholesterol unchanged.

Going nuts

Although nuts do pack in the fat and calories, ranging from 10 to 22 grams of fat and 150 to 180 calories per ounce, a little goes a long way. Fortunately, the fats found in nuts are primarily unsaturated fatty acids (both monounsaturated and polyunsaturated), which have been shown to lower the risk of heart disease and reduce LDLs. A clinical trial published in the Sept. 2002 issue of *Circulation* (106(11):1,327-1,332) found that subjects who ate about one ounce of almonds each day lowered their LDL cholesterol by 4.4% percent from baseline.

The nuts that score highest on heart-health benefits include: walnuts, almonds, pecans, hazelnuts, pistachios, some pine nuts and peanuts. The cholesterol-lowering effect is mostly attributed to the mono- and polyunsaturated fat content, but may also be attributed to their other components, such as fiber and phytosterols, and each nut's amino-acid composition.

Cardio cocoa

Cocoa powder is extremely rich in polyphenols and has been shown to inhibit LDL oxidation. One study, published by the *American Journal of Clinical Nutrition* (2007; (85(3):709-717), found a significant increase in plasma HDL cholesterol (24%) when compared to the control group (5%). Participants in this study consumed cocoa powder with 26 grams of polyphenols daily for 12 consecutive weeks. Studies surrounding cocoa parallel those showing a positive correlation between the inhibition of LDL oxidation and the phenols derived from red wine.

Although we have made many strides in our understanding of food and its effect on cholesterol and heart health, no one food or food component can be the magic cure-all. Many of these foods described here work best in conjunction with each other in a well-balanced diet, and food products that effectively combine those qualities will deliver valuable cholesterol-management tools for consumers.

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