Heart Health or Hype? Exploring the effect of diet trends on cardiovascular disease

Jonathan Klein, Medicine 2010 and Laura Hinz, Medicine 2011
Reviewed by Dr. Lynn Bergin

Certain foods have been touted as providing special benefits in preventing cardiovascular disease. We reviewed the literature supporting cardioprotective effects from cranberries, chocolate, dairy foods, and omega-3 fatty acids. To varying degrees, all four of these categories of food provide demonstrated benefits for heart health. For each food investigated, we provided insight into how they can be incorporated into a healthy lifestyle along with some caveats against their overuse. A balanced, nutritious diet including some of these foods, combined with an active lifestyle, can provide proven benefits for cardiovascular health.

Introduction
The importance of eating a balanced diet and engaging in regular exercise for the maintenance of good health is generally accepted as common sense and is supported by rigorous scientific investigation. Obesity and inactivity rates continue to rise steadily, however, bringing with them a host of disorders such as diabetes mellitus and cardiovascular disease (CVD). In the face of increased CVD incidence, many foods have been touted as being especially good for the heart. In this article, we investigate the biochemistry and evidence for the cardioprotective effects of cranberries, chocolate, dairy foods, and omega-3 fatty acids, which have all received attention for their potentially heart healthy properties.

Cranberries
Evidence and Biochemistry: Cranberries have been promoted for putative wide-ranging health benefits, so much so that the journal Critical Reviews in Food Science and Nutrition devoted an entire 2002 issue to extolling the fruit’s virtues. From preventing urinary tract infections to protecting against gastric ulcers to reducing the risk of cardiac events, cranberries have been credited for providing significant health benefits beyond those of other fruits. Flavonoids are a group of molecules with a common diphenylpropane (C6-C3-C6) moiety, which contains two aromatic rings linked by a six-member ring. There are six different categories of flavonoids characterized by variation in the central ring. Cranberries contain many different flavonoid classes including flavonols, flavan-3-ols, and anthocyanins.

Flavonoids have been identified as cardioprotective compounds due to their antioxidant effects. Substantial evidence has demonstrated that oxidation of low density lipoprotein (LDL, the so-called “bad cholesterol”) contributes to atherosclerosis, one of the main predictive factors of heart attacks and strokes.

Several large studies, including the INTERHEART study, have shown significant health benefits from diets high in fruits and vegetables, such as the Mediterranean Diet. Though many mechanisms for these results have been proposed, much attention has focused on a class of compounds called flavonoids, which are present in high concentrations in cranberries and other fruits. Flavonoids are a group of molecules with a common diphenylpropane (C6-C3-C6) moiety, which contains two aromatic rings linked by a six-member ring. There are six different categories of flavonoids characterized by variation in the central ring. Cranberries contain many different flavonoid classes including flavonols, flavan-3-ols, and anthocyanins.

Flavonoids have been identified as cardioprotective compounds due to their antioxidant effects. Substantial evidence has demonstrated that oxidation of low density lipoprotein (LDL, the so-called “bad cholesterol”) contributes to atherosclerosis, one of the main predictive factors of heart attacks and strokes.

Figure 1: Structure of flavone (2-phenylchromen-4-one), the chemical backbone of the flavonoids. Addition of functional groups to flavone produces different flavonoids. For example, reducing the ketone group to a hydroxyl yields a flavonol.
Oxidized LDL is preferentially taken up into macrophages and foam cells), which are major constituents of atherosclerotic plaques. By reducing the oxidation of LDL, flavonoids help prevent this accumulation of plaque, decreasing morbidity and mortality from CV disease. It seems that only small amounts of flavonoids are needed to achieve their beneficial effects, so even occasional consumption of cranberries may be cardioprotective.

Ruel and Couillard have also shown that there is some evidence for cranberries improving plasma lipid profiles, another strong predictor of cardiovascular disease. The evidence suggests that cranberries may be able to increase HDL and decrease LDL levels in the blood, but some studies have failed to show a change in serum lipid levels.

**Verdict:** Cranberries seem to confer significant benefits on cardiovascular health, mostly through flavonoid-mediated inhibition of oxidation of LDL. Including fresh cranberries or cranberry juice in the diet can reduce the risk of atherosclerosis and subsequent events such as strokes or infarction. However, these benefits may not be exclusive to cranberries, as research has shown similar outcomes with diet high in other fruits and vegetables (such as the Mediterranean diet). Consumers should also be wary of the advertised benefits of cranberry juice. While these juices do contain flavonoids and other beneficial compounds, investigators exclusively studied the benefits of low-calorie juices. Most commercial juices are high in sugar, which can contribute to obesity and other associated health problems. For an effective public-health campaign to be built around cranberry juice, it must be explicit that fresh cranberries and low-calorie juices will confer the greatest health benefits. All in all, the data is strong suggesting that adding cranberries to an already balanced diet may reduce the onset of cardiovascular symptoms.

**Chocolate**

**Evidence and Biochemistry:** Many news outlets have publicized studies demonstrating the benefits of chocolate consumption. While the reports have been careful to warn against gorging on chocolate bars in an effort to stave off atherosclerosis, many people may still be tempted to add large amounts of chocolate to their diet, possibly believing that protecting their hearts is outweighs the risks of excessive junk food consumption.

Studies on chocolate and cardiovascular disease have focused on the effects of dark chocolate and cocoa consumption. The protective mechanism is similar to that of cranberries, with flavonoids acting as the primary cardioprotective agent. Chocolate contains large amounts of catechins, which are flavan-3-ol flavonoid compounds, and procyanidins, another class of flavonoids. The mechanism mimics that of cranberries, with an increase in anti-oxidant effects inhibiting LDL oxidation and preventing formation of arterial plaques.

Studies have also demonstrated that chocolate and cocoa consumption can raise levels of high density lipoproteins (HDL, the “good cholesterol”), which has been shown to decreased susceptibility to cardiac events. Increased HDL levels have been hypothesized to suppress LDL oxidation by one of several mechanisms including inhibition of monocyte chemotaxis leading to decreased atherosclerosis and direct hydrolysis of lipid peroxide. Some studies, however, have failed to demonstrate significant changes in HDL:LDL ratios, so chocolate alone should not be used to treat lipid disorders. An average increase in HDL levels of 4% and 8% longer lag time in LDL oxidation were observed in patients on an average American diet supplemented with 16g of dark chocolate and 22g of cocoa powder per day.

**Verdict:** Medical consensus holds that chocolate and cocoa can protect against cardiovascular disease, likely via flavonoid-mediated LDL antioxidation and increased HDL levels. However, the observed effects on the serum lipids were relatively minor –hardly sufficient to counter the fact that chocolate is a high-fat, high-sugar food lacking the overall nutritional value of other rich flavonoid sources such as fruits and vegetables. Experimental studies focused only on dark chocolate and cocoa consumption (not other varieties, like milk chocolate) and were careful to study diets similar to a standard American diet.
in nutritional value and caloric intake. Thus, adding chocolate to the diet without eliminating an equivalent source of calories and maintaining proper nutrition has not been shown to improve health and intuitively seems likely to contribute to poor health through increased weight and adipose build-up. Our recommendation is that dark chocolate or cocoa may be consumed to prevent heart disease, but only as part of a balanced, nutritional diet. While (arguably) less enjoyable, it may be more beneficial to overall health to seek a different source of flavonoids, such as fruits and vegetables.

**Dairy Products**

*Evidence:* Milk consumption has traditionally been associated with increased cardiovascular disease due to its high cholesterol and saturated fat content, which have been causally linked to atherosclerosis. However, several epidemiologic studies have demonstrated reduced risk of atherosclerosis with increased milk intake. Further evidence for cardioprotective effects of dairy foods comes from the so-called “French paradox;” the typical diet in France is high in saturated fats and cholesterol, but the citizens tend to have a lower incidence of heart disease. These data suggest that further consideration of dairy products as protective against cardiovascular disease is warranted.

One hypothesis for milk’s cardioprotection is that it reduces susceptibility to the metabolic syndrome, which can lead to cardiovascular disease. The World Health Organization defines metabolic syndrome as glucose intolerance, impaired glucose tolerance or diabetes mellitus and/or insulin resistance together with two or more of: blood pressure above 140/90, high plasma triglycerides and/or low HDL, central obesity and microalbuminuria.

Several studies have shown inverse relationships between dairy food consumption and all aspects of the metabolic syndrome. These studies have shown that milk has a protective effect in both men and women and across populations of different ethnicities and nationalities. The incidence of type II diabetes mellitus, one of the components of the metabolic syndrome and a disease also characterized by insulin resistance, was demonstrated to decrease with higher dairy intake. The effect was even larger if the study participants consumed only low-fat dairy products.

Dairy foods may also prevent weight gain, and might even promote loss of abdominal fat. This would, in turn, reduce the risk of obesity leading to onset of metabolic syndrome, which would prevent the resultant cardiovascular disease. One explanation for this effect holds that dietary calcium may play a role in regulation of energy metabolism. Dairy foods can also have antihypertensive effects, as eating 35 or more servings of dairy per week halved the 10-year risk of developing hypertension as compared to eating 10 or fewer servings in the CARDIA study. This effect may result from peptides produced by lactic acid bacteria present in milk products inhibiting ACE enzyme and endothelin release, two known antihypertensive agents.

*Verdict:* Even though dairy foods contain significant amounts of CVD-promoting fat and cholesterol, the evidence suggests that dairy products are actually cardioprotective. The dramatic results of the CARDIA study show significant antihypertensive effects, though it is unrealistic to expect people who would not otherwise do so to eat 35 or more servings of dairy foods per week. However, even moderately increasing dairy consumption can be beneficial. Dairy foods also play an important role in protection from metabolic syndrome and type II diabetes. Low fat and skim milk and yogurt seem to have the most pronounced effects, and people wishing to increase their dairy consumption should focus on these foods. Though the evidence is strong for dairy products’ benefits, it is important to remember that dairy foods will not protect against CVD in the absence of other interventions like a balanced diet and active lifestyle.

**Omega-3 fatty acids**

*Evidence:* Of all the dietary elements claiming cardiovascular benefits, few have garnered more attention than omega 3 fatty acids. Eggs, bread, yogurt and other foods are fortified with these compounds and display attention-grabbing labels touting their high levels of omega-3. Dietary

---

**UWOMJ 77(2) 2008 18**
supplements containing omega-3’s are also being marketed with promises to deliver improvements in health.\(^3\)

Omega-3 fatty acids are essential fatty acids naturally present in fish, flaxseed, walnuts, canola oil, and soybean oil. They are so named because they are characterized by a double bond beginning at the third-last carbon atom in their chain, the third carbon from the “omega” end of the chain. The three main omega-3 fatty acids consumed are alpha-linolenic acid, eicosapentaenoic acid and docosahexaenoic acid.\(^4\)

Omega-3 fatty acids have been demonstrated to exert antiatherogenic, antithrombotic, and antiarrhythmic effects, all of which contribute to their prevention of cardiovascular diseases.\(^5\) Investigations using many different designs have linked omega-3 fatty acid and fish consumption to reductions in cardiovascular disease. Epidemiologic studies include the Health Professionals Follow Up study\(^6\) and the Nurses Health Study\(^7\) which followed 45,722 and 76,283 subjects for average follow up times of 14 and 10 years, respectively. The Nurses Health Study showed a relative risk of fatal ischemic heart disease of 0.55 for the cohort with the highest consumption of omega-3’s versus the group with the lowest consumption. Other studies and meta-analyses have demonstrated inverse relationships between omega-3 consumption and mortality, both all-cause mortality and that from cardiovascular disease (coronary artery disease, MI, stroke, etc.).\(^8\)

Given the benefit to heart health demonstrated by these studies, it is not surprising that omega-3’s have received huge publicity and are potentially exploited by dubious companies and products. A search for “omega 3” on the popular search-engine www.ask.com yielded links to websites claiming extra benefits for such products as Norwegian “virgin salmon oil.”\(^9\)

Other sites promote “clean” and “natural” omega-3 sources\(^10\) and oils derived from “gently pressed” sources.\(^11\) Such products typically come in pill form with recommended doses of up to 3 per day, ensuring a high cost for their continued use.

**Verdict:** A resounding yes. The evidence is extremely strong that including fish and other omega-3 sources in the diet, even in moderate amounts, can provide major benefits in reduction of cardiovascular disease. However, there is a potential for exploitation and false claims to abound due to lack of public understanding. Claims of special efficacy from certain types or sources of omega-3 and claims that intuitively unhealthy foods like bacon are actually healthy should be ignored. Nevertheless, fish and other omega-3 fortified foods like eggs and yogurt should be added to the diet of heart-conscious people. The American Heart Association and World Health Organization both recommend two servings of fish per week, especially oily fish like salmon, tuna, and trout. Diets such as the Mediterranean diet\(^12\) are good sources of guidance for incorporating omega-3 fatty acids into a healthy diet.

**Conclusion**

Diet plays a powerful role in cardiovascular health, but this will not come as news to most people. However, certain foods seem to confer more benefits than others, whether by changing lipid profiles, moderating the metabolic syndrome, anti-thrombotic effects, or other mechanisms. Strong evidence backs cranberries, dairy foods, chocolate, and omega-3 fatty acids as protective against cardiovascular disease. A few studies received funding or other support from corporations with interests in the results\(^3,11,30\) which creates a potential for biases. However, the vast majority of studies cited in this paper did not declare any competing interests and the evidence remains strong.
supporting the cardioprotective effects of the aforementioned foods.

These effects demonstrate that what we eat can powerfully impact the health of our hearts. However, it is important not to overstate the impacts that these foods can deliver. After surveying the evidence, a Starbucks Mocha Latte may seem to be a new “superfood”- after all, it contains chocolate and caffeine for antioxidants, milk for calcium, and healthy fats. But that doesn’t cancel out the sugar and unhealthy fat associated with those beneficial compounds. No single food will prevent heart disease nor is adherence to every new guideline required to be protected, but modern research continues to support Hippocrates’ idea that food has the power to heal. Regular exercise and a balanced diet including some of the foods discussed in this article will go a long way toward maintaining a healthy heart.

References


