

Cardiovascular Friendly Natural Foods and Supplements - A Brief Review: Part II

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ABSTRACT

Cardiovascular disease is the leading cause of death globally. Epidemiological studies demonstrate that populations consuming a large proportion of plant-based foods, especially fruits and vegetables, are known to have a lower incidence of cardiovascular diseases. These cardio-protective effects result primarily from the lipid lowering effects, antioxidant actions, and decreased homocysteine levels of these foods. Many of these naturally occurring functional foods also exhibit beneficial anti-inflammatory effects. These healthy diets are usually associated with lower intakes of saturated fats and calories, contributing to the heart healthy low body weights, low blood pressure, and low blood cholesterol concentrations seen in these populations. This brief review looks at heart healthy foods with evidence based data supporting their functional significance.

1. INTRODUCTION

Cardiovascular diseases are the main cause of death worldwide. Data from experimental, epidemiological and clinical studies provide compelling evidence that several natural products have protective and therapeutic activity against cardiovascular diseases. These cardio-friendly effects are exerted through intriguing complex substances, which include flavonoids, resveratrol, lycopene, omega 3 fatty acids, procyanidins and many others. The mechanisms include anti-inflammatory, anti-oxidative, vasoprotective (decreased TNF α production), reduced platelet reactivity and reducing thrombosis, promoting normal endothelial function, blocking expression of cellular adhesion molecules and reduction in blood pressure and lipids. Many of these natural substances however do not provide the same cardio-protective effect when taken as a single purified compound. On the contrary, several large and well structured evidence based studies have shown that some supplementation may actually be harmful. Healthy food choices therefore play an important role in ingesting these agents in their cardio-protective form. Nutritional lifestyle changes

incorporating heart healthy natural foods can greatly help stem the scourge of cardiovascular morbidity and mortality sweeping throughout the world. Studies also show that prudent dietary ingestion of these products help promote general health, and delay or attenuate several other disease processes. This brief review looks at sixteen heart healthy foods with scientifically documented beneficial effects. This is the second part of the article and lists the remaining eight heart healthy foods.

2. METHODS

A review of all citations on PubMed regarding eight natural foods and cardiovascular diseases was done. We found: green tea - 334 citations dating back to 1972, legumes - 1392 entries dating back to 1960, nuts - 420 entries dating back to 1952, olive oil - 610 entries dating back to 1963, psyllium - 5897 entries dating back to 1951, soy proteins - 617 entries dating back to 1963, turmeric - 93 entries dating back to 1991 and whole grains - 337 entries dating back to 1956. Other relevant scientific articles and studies with evidence based data were also reviewed.

3. DISCUSSION

Natural foods are derived from nature. They are minimally processed and do not contain manufactured ingredients. Evidence based medicine has confirmed the health benefits of the following products, in the prevention, management and treatment of cardiovascular diseases.

3.1. Green Tea

3.1.1. Clinical Data

Most studies confirm that consumption of green tea is associated with a reduced risk of developing and aggravating cardiovascular diseases. The Ohsaki study clearly demonstrated that green tea consumption is inversely associated with mortality due to all causes and due to cardiovascular disease, especially stroke related mortality. This study involved more than 40,000 people. They found that women who drink five or more 3.4-ounce cups of green tea every day cut their risk of heart disease by 31% compared with women who drink one or fewer 3.4-ounce cups. Men who drink this much green tea cut their heart disease risk by 22% (Kuriyama et al, 2006). Yang and colleagues reported in 2004 the benefits of tea drinking in 1507 individuals in Taiwan. They found that tea consumption of 1 to 5 cups per day reduced the risk for incident hypertension by 46% after adjusting for other risk factors (Yi-Ching Yang, 2004). Hiroyasu Iso and colleagues in 2006 showed that in 17,143 Japanese individuals between the ages of 40 and 65, regular consumption of coffee or green tea reduced the risk of incident diabetes by approximately one third (Hiroyasu Iso et al, 2006).

3.1.2. Mechanisms

Babu and Liu reported in 2008 that catechins, the major cardio-protective polyphenolic compounds in green tea, exert vascular protective effects through diverse mechanisms: (Babu et al, 2008) scavenging of free radicals, chelating redox active transition-metal ions, inhibiting redox active transcription factors, inhibiting pro-oxidant enzymes and inducing antioxidant enzymes, there is reduced oxidant activity, inhibiting intestinal lipid absorption and inhibiting key enzymes involved in lipid biosynthesis, thereby improving blood lipid profile, improving vascular tone by activating endothelial nitric oxide, suppressing leukocyte adhesion to endothelium, reducing vascular inflammation, and subsequent transmigration, interfering with vascular cell growth factors involved in atherogenesis by inhibiting the proliferation of vascular smooth muscle cells and inhibiting thrombogenesis by suppressing platelet adhesion. Theanine in green tea may play a role in reducing stress.

3.1.3. Clinical Implications

Evidence based data provides compelling evidence that regular ingestion of green tea is associated with cardiovascular protection. The amount necessary for cardiovascular benefits is not clear, although many studies have used four to five 3.4 oz cups imbibed a day as showing cardiovascular protection.

3.2. Legumes

3.2.1. Clinical Data

In the First National Health and Nutrition Examination Survey Epidemiologic Follow-up Study, which studied 9632 men and women, legume consumption 4 times or more per week compared with less than once a week was associated with a 22% lower risk of coronary heart disease risk and an 11% lower risk of cardiovascular disease (Bazzano et al, 2001). In a study of Japanese men and women, the highest intake of legumes (4.5 servings per week) was associated with a 16% reduced risk of total CVD and a 10% reduced risk of total mortality (Nagura et al, 2009). A

Mediterranean diet has been associated with a 14% lower mortality among the 23,349 participants during 8.5 years. It has been estimated that high legume consumption contributed to almost 10% of this protective effect (Kim et al, 2004).

3.2.2. Mechanisms

Legumes are rich in cardio-protective polyphenols (Ginter et al, 2012) which reduce the generation of oxidized low density lipoproteins, induce nitric oxide production, inhibit platelet aggregation and down regulate expression of pro-inflammatory mediators. Legumes are also rich in fiber, which improve several cardiovascular risk factors (Ute Nöthlings et al, 2008). These effects include lipid reduction, body weight regulation, improved glucose metabolism, blood pressure control and reduction of chronic inflammation. Legumes also reduce fasting glucose and insulin and improve HbA1c (Lydia et al, 2011; Jiang et al, 2009). Regular consumption also reduces all cause and cardiovascular mortality in diabetic patients.

3.2.3. Clinical implications

Evidence based data support the important role of legume intake in cardiovascular protection. (Geil et al, 1994) A cardio-protective diet should incorporate consumption of 3 cups of dried beans or peas per week.

3.3. Nuts

3.3.1. Clinical Studies

Several epidemiological studies have shown that regular tree nut consumption is associated with a reduction in all cause mortality and ischemic heart disease (Sabate, 1999). Several large epidemiological studies have found a protective action of frequent nut consumption against coronary heart disease (CHD). In the 31,208 participants enrolled in the Adventist Health Study, subjects in the highest nut intake group had an approximate 35% reduced risk of CHD compared to those in the lowest intake group (Fraser et al, 1992). Regular nut consumption was associated with a lower risk of sudden cardiac death and other coronary heart disease end points among 21,454 male participants enrolled in the US Physicians' Health Study and followed for an average of 17 years (Albert et al, 2002). Nut consumption was associated with a decreased body mass index, waist circumference and systolic blood pressure (all cardiovascular risk factors) when compared with non-consumers (O'Neil et al, 2011). Nut consumption is associated with decreased prevalence of type 2 diabetes – another cardiovascular risk factor (Jiang et al, 2002).

3.3.2. Mechanisms

Tree nuts including peanuts are nutrient dense foods with complex matrices rich in unsaturated fatty and other bioactive compounds: high-quality vegetable protein, fiber, micronutrients such as copper and magnesium, folic acid, tocopherols, phytosterols and polyphenolic compounds. Factors such as dietary fiber and other bioactive constituents in these natural foods may also confer additional cardio-protective effects. Nut intake is associated with positive cardiac changes in several biomarkers, such as: reduction in total and LDL cholesterol levels, LDL:HDL ratio and LDL oxidizability, reduction in inflammatory molecules and improved endothelial dysfunction.

3.3.3. Clinical implications

Epidemiological and dietary intervention data provides compelling evidence that consuming an ounce or more of nuts a week is associated with cardiovascular protection. The following equal one ounce: 24 almonds, 14 English walnut halves, 15 pecan halves, 12 macadamia nuts, 18 medium cashews, 12 hazelnuts or filberts, 35 peanuts or 8 medium Brazil nuts. A one-ounce serving of nuts contains between 160 and 200 calories.

3.4. Olive Oil

3.4.1. Clinical Studies

Epidemiological studies show that the incidence of coronary heart disease is low in countries that use olive oil almost exclusively. Olive oil is the main fat in the Mediterranean diet and is a major reason behind the Mediterranean cardiovascular paradox – a low cardiovascular mortality in spite of a high prevalence of classical cardiovascular risk factors. Compared to patients on AHA Set I diet, those following Mediterranean diet had a 50%-70% lower risk of recurrent heart disease (de Lorgeril et al, 1999). In the CARDIO2000 study, the Mediterranean diet was associated with an adjusted 23% rate reduction in the risk of developing a first event of acute coronary syndrome (Panagiotakos et al, 2002). In the ATTICA study of 3042 adult men and women, consumption of a Mediterranean diet was associated with a 26% lower relative risk of being hypertensive (Pitsavos et al, 2003). The Healthy Ageing Study showed that a Mediterranean diet was associated with 23% lower risk of death (Knoops et al, 2004).

3.4.2. Mechanism of action

Olive oil is rich in the beneficial mono-unsaturated fatty acids. Studies demonstrate significant improvements in biomarkers for cardiovascular disease in subjects exposed to high olive oil diets. There is: a decrease in LDL cholesterol levels, a better postprandial glucose, insulin and triglyceride response, a reduced postprandial activation of factor VII, as well as the production of factor VII antigen, diminished inflammation, decreased oxidative stress and an improvement in endothelial dysfunction. These actions result in reduced atherosclerosis. These findings are well elucidated in a review on olive oil and the cardiovascular system by Mar'ia-Isabel Covas in the 2007 issue of Pharmacological Research (Mar'ia-Isabel et al, 2007).

3.4.3. Clinical implications

Evidence based data provides compelling evidence that replacing other cooking oils or saturated fats with olive oil is associated with cardiovascular protection. The recommended dose of 2 tablespoons (23 grams) of olive oil daily is expected reduce the risk of coronary heart disease.

3.5. Psyllium

3.5.1. Clinical Studies

Psyllium is a soluble fiber that is obtained from a shrub called *Plantago ovata*. It is the main ingredient of Metamucil and is commonly used to relieve constipation. Epidemiological and clinical studies in both men and women suggest that increased dietary fiber intake protects against coronary heart disease (Erkkilä et al, 2006). It is estimated that increased fiber intake as a dietary supplement has contributed to the reported 30% decline in death rate from coronary artery disease observed over the past 15 years. Total, insoluble, and soluble dietary fiber intakes were inversely associated with risk of mortality from CHD and total CVD for both Japanese men and women (Eshak et al, 2010). Water-soluble fiber in the diet serum total and LDL cholesterol concentrations (Theuwissen et al, 2008; Anderson et al, 2000). It helps reduce high blood pressure and arterial stiffness (Pal et al, 2011). It improves metabolic syndrome (Pal et al, 2012). Obesity and diabetes mellitus are two major risk factors for cardiovascular diseases and a high-fiber diet has been correlated with a lower BMI and reduced incidence of dysglycemia. This was established by a meta-analysis of 8 studies by Anderson and associates in the 2000 (Anderson et al, 2000).

3.5.2. Mechanism of actions

Humans ingest four major water-soluble fiber types-beta-glucan, psyllium, pectin and guar gum. Soluble fiber decreases serum total and low-density lipoprotein cholesterol concentrations - psyllium binds to the bile acids in the gut and prevents their normal reabsorption, similar to the bile acid sequestrant drugs. It thus reduces lipid levels and can be used as an adjunct to diet or in addition to statins for treatment of hypercholesterolemia. Psyllium improves insulin resistance, has a hypotensive effect, exerts an anti-oxidant effect and has an anti-obesity action. Increased fiber consumption in the form of psyllium supplementation provides a safe, well tolerated and cost effective means to reduce blood pressure, lower lipids, improve vascular function and decrease the risk of developing cardiovascular diseases.

3.5.3. Clinical implications

Evidence based data provides strong evidence that increased soluble dietary fiber or psyllium supplementation is associated with cardiovascular protection. The usual recommended dose is 1/2 - 2 tsp of psyllium seed added to 1 cup (8 oz.) of warm water taken daily.

3.6. Soy Proteins

3.6.1. Clinical Studies

Epidemiological studies of Japanese populations who consume soy foods as a dietary staple have consistently shown to suffer from a lower incidence of CVD than those who consume a typical Western diet (Gil-Izquierdo et al, 2012). There was significantly lower total cholesterol, LDL cholesterol and triglycerides in a 1995 meta-analysis of 38 controlled clinical studies (Anderson et al, 1995). No effects were noted on the HDL cholesterol. Rabbits fed soy isoflavone extract showed an attenuation of atherosclerosis (Yamakoshi et al, 2000). Primates show a reduction in atherosclerosis when their diet contains 20% soy proteins. This anti-atherogenic effect has also been established in humans (Thomas et al, 2001; Anthony et al, 1995).

3.6.2. Mechanism of actions

The cardiovascular protective effects are mediated by components associated with soy protein: trypsin inhibitors, phytic acid, saponins, isoflavins and fiber. Soy is also a rich dietary source of isoflavones, representing a group of phytoestrogen compounds (genistein, daidzein, and glycitein). Isoflavones have been

associated with anti-atherogenesis secondary to their hypocholesterolemic effects, antioxidant effects and estrogen-like vascular effects.

3.6.3. Clinical implications

Evidence based data supports the cardiovascular benefits from the consumption of soy protein in place of animal protein efficiently lowers blood cholesterol levels and may provide other cardiovascular benefits. It is recommended that a daily consumption of ≥ 25 g of soy protein with its associated phyto-chemicals intact should be incorporated in our diet. Since soy protein contains calories, it should be used in the diet to replace animal protein, other vegetable proteins or fats.

3.7. Turmeric

3.7.1. Clinical Cardiovascular Benefits

Turmeric has beneficial effects in patients on adriamycin in attenuating cardiovascular toxicity (Mohamad et al, 2009). There is a reduction in diabetic cardiovascular complications (Appendino et al, 2011). There may be some protection against cardiac hypertrophy and heart failure by reducing cardiac remodeling by altering renin-angiotensin-system-transforming growth factor beta1 and collagen axis (Hong-Liang et al, 2008). Turmeric appears to help in preventing atrial and ventricular arrhythmias and in maintaining normal cardiac rhythm. There is a reduction in heart attacks following coronary artery bypass surgery (Wongcharoen et al, 2009).

3.7.2. Mechanisms of action

K Curcumin (diferuloylmethane) is a polyphenol responsible for the yellow color of the curry spice turmeric. The clinical cardio-protective effects stem from the following actions: anti-inflammatory, anti-oxidant, anti-thrombotic, anti-proliferative, reduction in serum cholesterol levels and reduction in triglyceride levels (Hongyu et al, 2011; Srivastava et al, 2009; Menon et al, 2007).

3.7.3. Clinical implications

Evidence based data provides strong evidence that supplementation as a food choice is associated with cardiovascular protection. Curcumin provides a low cost supplement with a potential for prevention and treatment of cardiovascular diseases. However, larger human studies are needed to establish therapeutic values for curcumin supplementation.

3.8. Whole Grains

3.8.1. Clinical Cardiovascular Benefits

Epidemiological studies have demonstrated that individuals with higher levels of whole grain intake have a 21%-29% lower risk of cardiovascular disease than those with lower levels (Borneo et al, 2012; Mellen et al, 2008). Some of these effects are a result of positive modulation of cardiovascular risk factors such as hypertension, metabolic syndrome and obesity with whole grain intake (Kelly et al, 2007; Anderson et al, 2003). Whole grain intake is inversely associated with risk of type 2 diabetes, another risk factor for the development of cardiovascular disease (de Munter, 2007).

3.8.2. Mechanisms of action

Whole grains contain dietary fiber, resistant starch, trace minerals, certain vitamins, and other compounds which act as phyto-estrogens and antioxidants. These ingredients in whole grains help reduce LDL-cholesterol, reduce triglyceride levels, help increase HDL-cholesterol levels, induce favorable changes in the antioxidant status, improve serum homocysteine levels, increase vascular reactivity and reduce inflammatory state.

3.8.3. Clinical implications

Epidemiological and clinical studies provide compelling evidence for the positive modulation of cardiovascular risk factors with diets rich in whole grains. There is a significant decrease in cardiovascular morbidity and mortality and non-communicable chronic diseases in individuals whose diets are rich in whole grains. We should aim at getting 3 ounces of whole grains per day: 1 slice of bread, 1 cup of ready-to-eat cereal, or $\frac{1}{2}$ cup of cooked rice, cooked pasta, or cooked cereal can be considered as 1 ounce equivalent of whole grains.

4. CONCLUSIONS

The 5000 year old Indian science of Ayurveda, stresses the preventive and therapeutic benefits of natural foods, herbs and spices. The medicinal use of natural foods has also been explored by the Chinese, Egyptians and the Sumerians.

Hippocrates the father of Western medicine said: “Let food be thy medicine”. Modern medicine is recognizing that several natural foods and supplements have biologically active compounds that confer additional health benefits, besides having a nutritional value. Incorporation of these natural products in our daily diet can significantly help prevent, manage and treat cardiovascular diseases.

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