

PECANS AND GOOD HEALTH



A REVIEW OF THE RESEARCH

Following are highlights of several research studies, followed by general recent nutrition policies and guidelines that demonstrate that nuts (and pecans in particular) can be part of a healthy diet.

Antioxidant-Rich Pecans Protect Against Unhealthy Oxidation in the Body

Haddad, et al. A Pecan Enriched Diet Increases γ -Tocopherol/Cholesterol and Decreases Thiobarbituric Acid Reactive Substances in Plasma of Adults. *Nutrition Research*. August 2006. 26:397-402.

These findings are from the second phase of a research project designed to evaluate the health benefits of pecans. Researchers analyzed blood samples from study participants (a total of 23 men and women between the ages of 25 and 55) who ate two diets: one that contained pecans and one that did not. Participants were randomly placed on either the American Heart Association's Step I diet or a pecan-enriched version of the Step I diet. (The pecan-

enriched diet was similar to the Step I diet but replaced 20 percent of calories with pecans). After four weeks on one diet, they then switched to the other diet.

Results: In the laboratory analysis of blood samples from the research subjects, the researchers found that the pecan-enriched diets significantly reduced lipid oxidation (by 7.4 percent) versus the Step I diet. Oxidation levels were evaluated using the TBARS test, which measures oxidation products. The researchers also found that blood levels of tocopherols were higher after participants were on the pecan diet. Cholesterol-adjusted plasma gamma-tocopherol in the study participants' blood samples increased by 10.1 percent ($P < .001$) after eating the pecan diet. The researchers concluded that

these data provide some evidence for potential protective effects of pecan consumption in healthy individuals.

Another key research finding, beyond the reduced level of blood lipid oxidation, was that the various phytochemicals found in pecans seem to be protective of the pecan's high levels of unsaturated fat. All unsaturated fats in foods can be prone to oxidation themselves (which some may describe in foods as rancidity). The analysis found that pecans, while high in unsaturated fat, are "self-protective" due to their vitamin E content (tocopherols) and relatively high content of complex phytonutrients, some of which have been identified as proanthocyanidins, or condensed tannins, which are recognized for their ability to slow the oxidation process.

Pecans Double the Cholesterol-Lowering Effectiveness of a Traditional Heart-Healthy Diet

Rajaram et al. A Monounsaturated Fatty Acid-Rich Pecan-Enriched Diet Favorably Alters the Serum Lipid Profile of Healthy Men and Women. *The Journal of Nutrition*. September 2001. 131:2275-2279.

This eight-week, rigidly controlled, crossover study conducted at Loma Linda University compared the effect pecans have on blood cholesterol levels to a traditional low-fat American Heart Association (AHA) Step I diet. Dr. Sujatha Rajaram and her colleagues evaluated 23 healthy men and women (nine women and 14 men between the ages of 25 and 55) with normal to mildly elevated blood cholesterol levels. Participants were randomly selected to consume either an AHA Step I diet or a “pecan” diet (which consisted of replacing 20 percent of calories from the Step I diet food with pecans). The diets were then reversed for a second four-week period. Total serum cholesterol, high-density lipoprotein (HDL or “good”) cholesterol and triglyceride levels were measured at the end of each diet period.

Results: The researchers found that the pecan diet significantly lowered total cholesterol (11.3% compared with 5.2% on the Step I diet) and LDL cholesterol (16.5% compared with 6.7% on the Step I diet). In fact, the pecans doubled the cholesterol lowering ability of the Step I diet. The pecan diet increased HDL cholesterol levels whereas the Step I diet decreased HDL unfavorably. Triglycerides also were significantly lower with the pecan diet. Although the pecan diet contained more fat (39.6%) than the Step I diet (28.3%), participants did not gain weight.

Pecans Raise Critical Serum Vitamin E Levels: May Support Prostate and Intestinal Health

Haddad et al. Effect of a Pecan Rich Diet on Plasma Tocopherol Status. (Abstract published in the March 2001 *FASEB Journal*. Research presented at the April Experimental Biology 2001 meeting).

An analysis of the Vitamin E content of blood was done using samples from the same research participants studied by Rajaram et al (see previous study). Loma Linda’s Dr. Ella Haddad evaluated effects of a pecan-enriched diet on serum *gamma* tocopherol levels for this study. Because the pecan-enriched diet actually lowered cholesterol levels, the researchers determined it was critical that the ratio of plasma

tocopherol to cholesterol be determined.

Results: The researchers concluded that the pecan-enriched diet significantly raised blood levels of *gamma* tocopherol compared to the AHA Step I diet. This is due to the high amounts of naturally occurring *gamma* tocopherol (a unique form of vitamin E) in the pecans, said Dr. Haddad. The *gamma* tocopherol-to-cholesterol ratio was higher on the pecan-enriched diet compared to the control diet. According to Dr. Haddad, *gamma* tocopherol is an important antioxidant nutrient. Studies have shown that it may benefit intestinal health and have a protective effect against prostate cancer.

Pecans Increase Fiber and Nutrient Intake

Barloon et al. High Fat Pecan-Based Diet as Effective as Step I Diet to Maintain Plasma Lipid and Lipoprotein Responses. (Research presented at the May 2001 American Heart Association Conference on Arteriosclerosis, Thrombosis and Vascular Biology).

Researchers at Texas A&M University discovered that a heart-healthy diet containing pecans can help control specific biomarkers of heart disease risk as effectively as the AHA Step I diet. Forty hypercholesterolemic men and women between the ages of 22 and 71, all of whom had already been eating a relatively

low-fat diet, participated in the study. During the eight-week, randomized, controlled feeding trial, participants were placed on either the AHA Step I diet or an isocaloric but higher-fat, pecan-based diet. Since this was not a crossover study, the research participants ate one diet or the other, but not both.

Results: According to researchers Dr. Rosemary Walzem and Jessica Barloon, there were no significant differences in negative risk factors (e.g., c-reactive protein levels or lipoprotein size/density) between diets. However, the researchers found that the pecan-rich diet significantly increased participants' levels of dietary fiber, thiamin, magnesium, copper and manganese and actually changed dietary copper and magnesium intakes from inadequate (on the AHA diet) to adequate (on the pecan diet).

Pecans: A Concentrated Source of Natural Plant Sterols

Eitenmiller et al. Sterol Content of Peanuts, Pecans and Peanut Products. (Research presented at the 2000 Institute of Food Technologists meeting).

After conducting laboratory nutrient analyses, researchers at the University of Georgia (UGA) have determined that plant sterols – widely researched and touted for their cholesterol-lowering ability – are found naturally in pecans

in concentrated amounts. According to Dr. Ron Eitenmiller, pecans contain as much as 95 milligrams of plant sterols per 100 grams – 90 percent of which is in the form of beta-sitosterol. Beta-sitosterol has been cited in multitudes of animal and human research studies as a food component that competes with the absorption of cholesterol in the body, and thus has the ability to lower blood cholesterol levels. According to the researchers, by increasing consumption of pecans (or peanuts), a person could easily raise the plant sterol levels in the diet to the point where health effects have been proven.

Pecans Improve Heart Disease Risk Factors

Morgan et al. Pecans Lower Low-Density Lipoprotein Cholesterol in People with Normal Lipid Levels. *Journal of the American Dietetic Association.* 2000. 100: 312-8

Dr. Wanda Morgan at New Mexico State University conducted a study in which 19 men and women with normal blood lipid levels were divided into two groups, both of which consumed self-selected diets. One of the groups served as a control group and ate their regular diets for eight weeks (without eating any nuts). Subjects in the pecan test group, however, supplemented their regular diets with $\frac{3}{4}$ cup of pecans (about a handful) for eight weeks.

Results: The researchers found that adding pecans to a self-selected diet lowered LDL cholesterol levels by six percent and total cholesterol by four percent among those who ate pecans. Dietary fat, monounsaturated fat, polyunsaturated fat, insoluble sugar, magnesium, and energy also were significantly higher in the pecan group. However, despite the fact that the pecan diet contained more overall fat and calories, body mass indexes and body weights were unchanged in both groups.

Mediterranean Diet Including Nuts More Effective than Low-Fat Diets for Weight Loss

McManus et al. A randomized controlled trial of a moderate-fat, low-energy diet compared with a low-fat, low-energy diet, for weight loss in over-weight adults. *International Journal of Obesity.* 2001. 25: 1503-1511

Researchers from Brigham and Women's Hospital and Harvard School of Public Health evaluated 101 overweight men and women to determine the effects of a low-fat diet (20% calories from fat) versus a moderate fat diet (35% calories from fat, primarily mono-unsaturated fat from foods such as nuts, olive and canola oils). The study was a randomized, 18-month trial (in a free-living situation) that had participants follow one of the diets or the other.

Both diets were low in saturated fat and participants were instructed to consume between 1,200 and 1,500 calories.

Results: After the 18-month study period, participants in the low-fat group had a mean weight gain of about six pounds; their body mass index increased, as did their average waist circumference. However, those on the moderate fat diet decreased mean body weight by about nine pounds while also decreasing their body mass indices and waist circumferences. Only 20 percent of those in the low-fat group were participating in the weight loss program after the 18-month trial, compared with 54 percent of those in the moderate-fat group. The authors concluded, “A moderate-fat Mediterranean-style diet, controlled in energy offering an alternative to a low-fat diet with superior long-term participation and adherence, with consequent improvements in weight loss.” Moreover, those on the moderate fat diet were better able to adhere to the weight loss program than those who followed a low-fat diet.

Antioxidants in Pecans May Offer Stroke Protection

Yochum et al. Intake of Antioxidant Vitamins and Risk of Death from Stroke in Postmenopausal Women. *American Journal of Clinical Nutrition*. 2000. 72: 476-483

Foods such as nuts – an important dietary source of vitamin E – may significantly decrease the risk of death from stroke, according to this study from the University of Minnesota. The epidemiological study evaluated the relationship between antioxidant vitamin intake and stroke. The researchers tracked the food intake and health outcomes of 34,492 post-menopausal Iowa women (participants of Iowa Women’s Health Study) for a number of years. Participants responded to questions regarding their demographic characteristics, including medical history and health habits. A food frequency questionnaire was used to gather information about their diet. Upon completion of the study, the researchers evaluated the possible relationship between stroke and intake of antioxidant vitamins.

Results: The researchers found that death from stroke was 60 percent lower among those consuming the most vitamin E from foods when compared to those who consumed the least. These findings are of particular importance as the Recommended Daily Intake (RDI) for vitamin E was recently raised for both men and women. This population research suggest that eating foods like pecans – which are rich in a number of healthy nutrients, including vitamin E – helps increase levels of vitamin E in the diet. The researchers concluded,

“Overall, our results suggest that higher intakes of vitamin E from foods (compared with lower intake from foods) may be associated with a lower risk of death from stroke. Vitamin E is a free radical scavenger and thus may help prevent oxidation of LDL, an important step in the atherosclerotic process.

Frequent Nut Consumption Lowers Heart Disease Risk

Kris-Etherton et al. The Effects of Nuts on Coronary Heart Disease Risk. *Nutrition Reviews*. April 2001. 59:4: 103-111.

This review of the literature looked at various clinical and epidemiological (population) studies that addressed a possible connection between consumption of nuts and their effect on coronary heart disease (CHD) risk. The review included several significant “epi” studies that were published prior to the preparation of this review paper.

Results: The authors of this review paper concluded “there is consistent evidence, especially from epidemiological studies, that nuts have a strong protective effect against CHD. Evidence from a growing database of clinical studies indicates that part of the cardioprotective effect of nuts is due to their favorable effects on plasma lipids and lipoproteins, owing to their fatty acid composition when they replace dietary

saturated fat and/or carbohydrates.”

Hu et al. Frequent Nut Consumption and Risk of Coronary Heart Disease in Women; Prospective Cohort Study. *British Medical Journal*. 1998. 317: 1341-5.

This epidemiological study found that frequent nut consumption was associated with a reduced risk of fatal coronary heart disease and non-fatal coronary heart disease. Participants in the well-known Nurses' Health Study (between the ages of 34 and 59) answered a survey regarding their dietary intake (including nut consumption) in 1980, 1984, 1986 and 1990. The questionnaire grouped nut consumption into four categories including: almost never, 1-3 times per month to once per week, 2-4 times per week and greater than 5 times per week. The responses were evaluated and analyzed to determine if an association between nut consumption and risk of fatal heart disease and non-fatal coronary heart disease existed.

Results: The researchers found that women who consumed one ounce portions of nuts frequently (more than 5 times a week) had a 35 percent lower risk of coronary heart disease, than those women who rarely ate nuts. The authors concluded, “These data and those other epidemiological and clinical studies support a role for nuts in reducing coronary heart disease risk.

Fraser et al. A Possible Protective Effect of Nut Consumption on Risk of Coronary Heart Disease. The Adventist Health Study. *Archives of Internal Medicine*. 1992. 152; 1416-1424.

Loma Linda University researchers evaluated diets of over 31,000 non-Hispanic white California Seventh-Day Adventists participating in the Adventist Health Study, a prospective cohort study. Participants completed questionnaires on their lifestyle, including food intake. On the food frequency questionnaire, participants categorized food intake on a scale of 1-8, ranging from “never consume” to “more than once per day.” The association between diet and coronary heart disease (CHD) events was determined via various methods.

Results: The researchers found that those who consumed nuts more than four times per week had fewer fatal CHD events and non-fatal heart disease events compared to those who consumed nuts less than once a week. Researchers concluded, “Our data strongly suggest that the frequent consumption of nuts may protect against risk of CHD events. The favorable fatty acid profile of many nuts in one possible explanation for such an effect.”

Pecans Are Most Antioxidant Rich Nut

Xianli Wu et al. Lipophilic and Hydrophilic Antioxidant Capacities of Common Foods in the United States. *The Journal of Agriculture and Food Chemistry*. May 2004. 52 (12), 4026-4037

This landmark study examined the antioxidant capacities of over 100 different kinds of foods, including fruits, vegetables, nuts, dried fruits, spices, cereals, infant, and other foods. Antioxidants are dietary substances that have been shown to delay aging and decrease the risk of cancer, heart disease, and neurological diseases like Alzheimer's.

Results: Using a method that had been shown to be a good indicator of the total antioxidant capacity of foods called ORAC (Oxygen Radical Absorbance Capacity), researchers found that pecans rank highest among all nuts and are among the top category of foods to contain the highest antioxidant capacity.

Pecans Aid Weight Control

Sabaté, Joan. Nut Consumption and Body Weight. *American Journal of Clinical Nutrition*. September 2003. Vol. 78, No. 3, 647S-650S

A review of pecan and other nut research suggests that nuts like pecans can aid in weight loss and maintenance.

Results: The review cited studies indicating that nut consumption may increase metabolic rates and enhance satiety. When used in conjunction with a low-fat diet, nuts also offer increased flavor, palatability and texture that can lead to greater dietary compliance, according to the review.

NUTRITION POLICY/GUIDELINES

U.S. Dietary Guidelines Tout Importance of Protein and Other Nutrients in Pecans

U.S. Department of Agriculture and U.S. Department of Health and Human Services. Dietary Guidelines for Americans. 2005. 6th Edition. MSNBC Interactive, Jan. 12, 2005

The government's newest Dietary Guidelines for Americans (January 2005) say Americans should vary their choices of protein "with more fish, beans, peas, nuts, and seeds." For the average person, that means eating about 5 ½ servings from the "meat and beans" category each day. Pecans and other nuts are included in this category because of their high concentration of important nutrients and proteins. One serving of pecans (about 20 pecan halves) is the same as eating about 2 ounces of meat (or 6 thin slices of ham) but with less saturated fat and no cholesterol. The U.S. Department of Agriculture

(USDA) and the U.S. Department of Health and Human Services (HHS) also unveiled a revised food pyramid to illustrate the importance of eating a variety of foods, including healthful fat, including nuts and olive oil, and for limiting foods with added sugar, saturated fat, and trans fatty acids. The new icon, named My Pyramid Food Guidance System, is based on the 2005 Dietary Guidelines, which were released in January '05 and represents the latest science available on the role of diet and nutrition in a healthy lifestyle.

Nutrition Guidelines for Diabetic Diets Emphasize Monounsaturated Fats

Franz et al. Evidence-Based Nutrition Principles and Recommendations for Treatment and Prevention of Diabetes and Related Complications. *Diabetes Care*. January 2002. 25: 148-198.

Diabetics can now select a diet rich in monounsaturated fat in lieu of diet that is low in fat and rich in carbohydrates, according to guidelines from the American Diabetes Association. An expert panel of 12 scientists formulated these evidence-based guidelines, which emphasize individualized diets and wide-ranging food choices. What led to this change is research that showed there are benefits to a diet high in monounsaturated fat (i.e., improvement in high-density

lipoprotein cholesterol, triglycerides and most importantly, diabetes control).

Specifically, the guidelines recommend that intakes of carbohydrate and monounsaturated fat should account for 60 to 70 percent of calories, and 15 to 20 percent of caloric intake should come from protein. Nuts are cited as a good source of monounsaturated fat.

AHA Supports Nutrients Found in Pecans

Krauss et al. AHA Dietary Guidelines. Revision 2000: A Statement for Healthcare Professionals from the Nutrition Committee of the American Heart Association. *Circulation*. 2000. 102: 2284-2299.

The American Heart Association's updated heart-healthy dietary guidelines echoed recommendations made in the government's 2000 Dietary Guidelines for Americans. The newest AHA guidelines specifically advise consumers to limit their intake of saturated fat and to "substitute grains and unsaturated fatty acids from fish, vegetables, legumes and nuts" in its place. The AHA guidelines note that dietary factors that can lower "bad" cholesterol include consumption of polyunsaturated and monounsaturated fats when substituted for saturated fats. The guidelines suggest nuts (such as pecans), which are

rich in polyunsaturated fat and monounsaturated fat and low in saturated fat, can play a role in a heart-healthy diet.

Kris-Etherton et al. Monounsaturated Fatty Acids and Risk of Cardiovascular Disease. *Circulation*. 1999. 100: 1253-1258.

According to this scientific statement from AHA's Nutrition Committee, "there is epidemiological evidence that dietary monounsaturated fats (MUFAs) have a beneficial effect on the risk of coronary heart disease (CHD).

Moreover, evidence from controlled clinical studies has shown that MUFAs favorably affect a number of risk factors for CHD, including plasma lipids and lipoproteins, factors related to thrombogenesis, in vitro LDL oxidative susceptibility (compared with polyunsaturated fats), and

insulin sensitivity. Compared with saturated fat, MUFAs lower total and LDL cholesterol levels, and relative to carbohydrate, they increase HDL cholesterol levels and decrease plasma triglyceride levels." Nuts are cited as a food this is high in monounsaturated fats and low in saturated fats.

Van Horn et al. Fiber, Lipids and Coronary Heart Disease: A Statement for Healthcare Professionals from the Nutrition Committee, American Heart Association. *Circulation*. 1997; 95: 2701-2704.

This AHA statement offers support for research by Barloon et al (reference earlier) which found that participants on a pecan-enriched diet consumed higher levels of dietary fiber than those on an AHA Step I diet. Says AHA, "The greatest

impact on lowering total and LDL cholesterol is derived from reduced intakes of saturated fats and cholesterol as well as weight reduction in obese persons. Diets high in complex carbohydrates and fiber are associated with reduced mortality rates from CHD and other chronic diseases." Incorporating pecans into the diet may help consumers reach AHA's recommended fiber intake of 30-45 grams per day.



Research compiled by the National Pecan Shellers Association.
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