ALMONDS: NUTRITION AND SCIENTIFIC RESEARCH

UPDATED OCTOBER 2017

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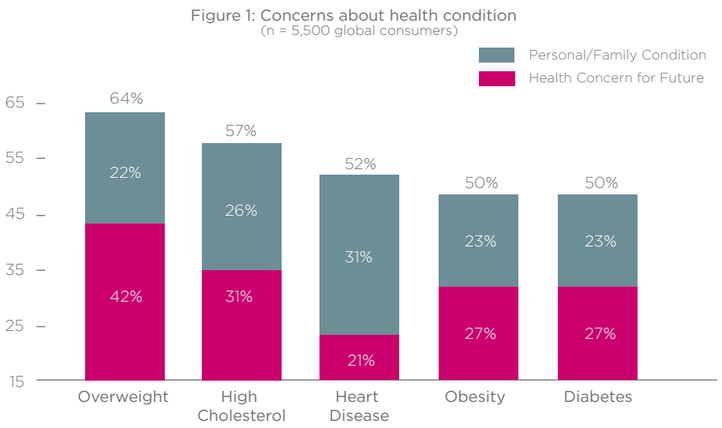
For more than two decades, Almond Board of California has invested in sound science to better understand the nutrient composition and health benefits of almonds. The ever-expanding body of almond nutrition research totals over 150 scientific publications to date, in areas including heart health, weight management, diabetes, nutrient composition and diet quality. Growing interest in weight management and smart snacking has prompted a shift in emphasis from the well-established body of evidence on heart health toward diabetes, weight management, satiety and cognitive research to support a healthy lifestyle. (See Figure 1.)

The powerful nutrient package of almonds—low on the glycaemic index and providing 6 grams of plant based protein, 4 grams of filling dietary fibre, 13 grams of unsaturated fats per handful (about 23 almonds) and important vitamins and minerals including vitamin E (60% DV), magnesium, and potassium—makes them an ideal fit for healthy lifestyles and a deliciously easy way to snack smarter.

Figure 1: Concerns about health condition
(n = 5,500 global consumers)



Source: Almond Board Global Perceptions Study, 2013.
Question: For the following health concerns, please indicate how impacted you are by each. (select all that apply.)

ALMONDS: A HEART-SMART SOLUTION

OVER TWO DECADES OF RESEARCH SHOWS THAT ALMONDS CAN HELP MAINTAIN A HEALTHY HEART AND HEALTHY CHOLESTEROL LEVELS.

Although heart disease remains the number one cause of death worldwide, it is estimated that at least 80% of premature deaths from cardiovascular disease could be avoided if diet and lifestyle risk factors are controlled.[1] Diet is integral to managing cardiovascular risk, and more than two decades of research support the role of almonds in helping to maintain a healthy heart. Many randomized controlled studies have been conducted to examine the impact of almond consumption on markers of heart health, such as total and LDL cholesterol, HDL cholesterol, abdominal fat, oxidative stress and inflammation.

ALMONDS AND CHOLESTEROL

A 2016 meta-analysis and systematic review examined the breadth of research on almonds and heart health. The analysis of 18 published randomized controlled trials with a total of 837 participants showed significant favourable effects of almonds on total cholesterol, LDL cholesterol and triglycerides, with no change in HDL cholesterol levels.[2] The effects of almonds on total cholesterol were dose-dependent, with a larger almond intake resulting in a greater reduction in total cholesterol. The evidence strongly indicates that almonds

PROTEIN
6g

VITAMIN E
7.3mg

FIBRE
4g

UNSATURATED FATS
13g

POTASSIUM
210mg

MAGNESIUM
76mg

28 GRAMS = 23 ALMONDS

should be encouraged as part of a healthy diet to help maintain healthy blood lipid levels and reduce the risk of heart disease.

HDL CHOLESTEROL AND ALMONDS

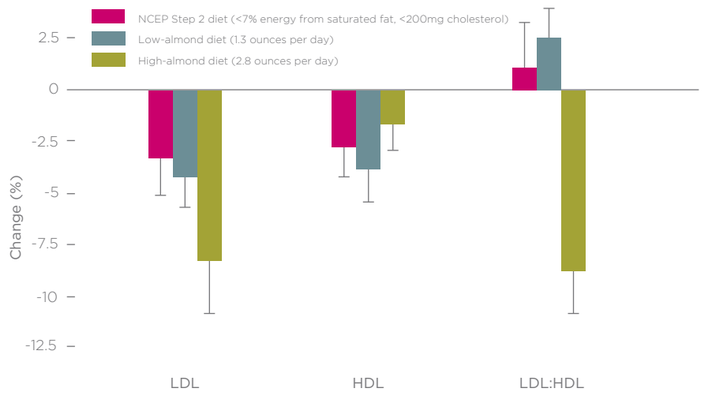
In general, cholesterol-lowering diets reduce HDL cholesterol. However, studies show that when almonds are included in such diets, there is no significant effect—protective HDL is preserved.[2]

Research supporting the role of almonds in heart health began in 1992, with the first study demonstrating that an almond-based diet (with 100 grams of almonds per day) improved cholesterol levels.[3] This landmark study helped set the stage for the almond nutrition research program and provided compelling evidence that despite their high fat and calorie content, almonds could be included as part of a heart-healthy diet.

In the majority of studies of people with high cholesterol, the daily consumption of 28 to 114 grams of almonds per day resulted in significant reductions in total and LDL cholesterol levels.[4,5,6] In one study, 27 adults with high cholesterol ate heart-healthy diets with one of three snacks over a three-month period: 79 grams of almonds, 37 grams of almonds or a low-saturated-fat whole-wheat muffin as a daily snack.[6] (See Figure 2.) Researchers found that participants lowered their LDL cholesterol level an average of 4.4% with the 37 gram portion of almonds and 9.4% with the 79 gram portion. These results suggest there is a "dose effect of almonds on cholesterol levels—that higher intakes are associated with greater cholesterol-lowering effects."

Another year-long crossover study on 81 U.S. adults (43 men and 38 women, age 49 years, BMI 25 kg/m2) found that daily consumption of their usual diet plus 52 grams per day of almonds for six months without any additional dietary advice vs. their usual diet without almonds improved both TC:HDL and LDL:HDL ratios. Participants with high cholesterol levels showed greater response in changes in total cholesterol, LDL and TC:HDL and LDL:HDL ratios than those with normal cholesterol levels.[7]

Figure 2: Change from baseline at four weeks in blood lipids on control, half-dose almonds and full-dose almonds. Values are mean ± SEM



Additionally, a four-week randomized analysis of previously collected data from 27 adults with elevated LDL cholesterol showed that eating almonds daily as part of a healthy diet improved participants' serum fatty acid profiles and reduced estimated (based on the Framingham equation) 10-year coronary heart disease risk scores by 3.5%.[8] Limitations included lack of randomization in the diet order and lack of control over external factors that may have affected dietary behaviors over the course of the study[7] and a relatively high dropout rate and potential confounding of MUFA intake.[8]

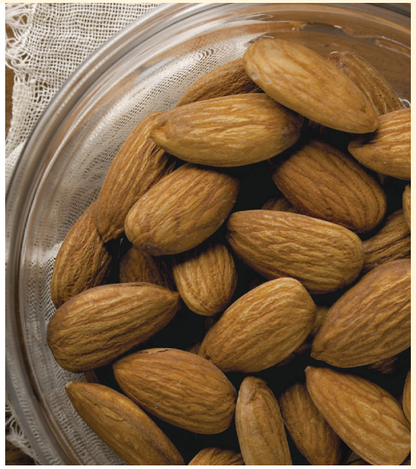
Two recent studies have examined the heart-health impact of swapping out higher carbohydrate snacks for almonds. In one study among Korean adults, researchers compared the effects of almond consumption versus cookies of equal caloric value as a daily snack on cardiovascular risk factors in 84 overweight and obese individuals.[9] They found that participants in the almond group experienced a significant decrease in total cholesterol, LDL cholesterol and non-HDL cholesterol compared to the cookie group. Almonds also enhanced vitamin E status and serum total and LDL cholesterol in the overweight and obese individuals. Thus, including almonds as a snack can help healthy overweight/obese individuals improve nutritional status and reduce risk for CVD. This was the first study to look at almond consumption in a Korean population. Although most of the research has been conducted in North American and European populations, we have seen similar results from studies in Taiwan, India, and now Korea, indicating that the heart-health benefits are similar between these genetically diverse groups.

In another study, 48 middle-aged women and men, normal and overweight, with elevated LDL cholesterol and normal HDL cholesterol levels at baseline, were assigned a cholesterol-lowering diet that either included almonds (43 grams per day) or a calorie-matched high-carbohydrate snack

(muffin).[10] Researchers assessed almond consumption vs. high-carbohydrate snack on HDL particle type, distribution and transport of cholesterol to the liver for elimination. Compared with the control diet, the almond diet increased the alpha-1 HDL subparticle (larger, more mature HDL; generally a marker of heart-health protection) as well as cholesterol efflux (removal of cholesterol from peripheral tissues for elimination), an important part of the cardio-protective role of HDL, in participants.

Research has also investigated the effects of almonds as part of a group of cholesterol-lowering foods, including plant sterols and soluble fibre. This diet, known as the Portfolio Eating Plan, consists of US-based National Cholesterol Education Program (NCEP) "Step 2" diet (saturated fat less than 7% of calories, less than 200 mg cholesterol) plus almonds (30 grams per day); viscous fibre (20 grams per day), such as oats, barley, psyllium, legumes, aubergine and okra (lady fingers); vegetable protein (80 grams per day, half from soy), such as soy foods, beans, chick peas and lentils; and plant sterols (2 grams per day), such as plant sterol margarine. Initial studies that were done in a controlled environment (with all meals provided) resulted in LDL cholesterol reductions of nearly 30% in study participants, 46 adults with high cholesterol.[11] Later studies conducted in people with high cholesterol who followed the Portfolio Eating Plan on their own showed more modest, but still significant, reductions in LDL, with an average reduction of 13% after one year of following the diet. The results from this collection of studies demonstrate that almonds can be part of a heart-healthy diet that—in combination with other cholesterol-improving components—effectively lowers cholesterol in study participants with high cholesterol.

While the majority of studies have been conducted in people with elevated cholesterol levels, there have also been studies investigating the impact of eating almonds on cholesterol in healthy people. The studies suggest that almonds have no detrimental effects on blood lipids and in fact, in one controlled-feeding study, eating 68 grams of almonds per day for a period of four weeks actually improved the blood lipid profiles of healthy men and women by significantly reducing total and LDL cholesterol levels and improving the ratio of LDL to HDL compared to no almond consumption, a remarkable finding given that all the participants were consuming a low saturated fat, National Cholesterol Education Program (NCEP) Step I diet.[12] A second study assessed the effect of eating a low-almond diet (10% of calories), a high-almond diet (20% of calories) or control diet (no almonds) in 16 healthy men and women (mean age 41 years).[13] The high-almond



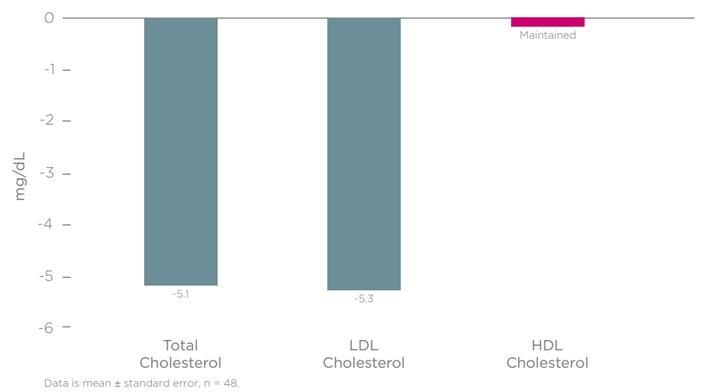
diets significantly lowered average total cholesterol (-10 mg/dL) and LDL cholesterol (-10 mg/dL) compared to the control diets, while also increasing vitamin E levels in a dose-response manner.

EMERGING RISK FACTORS: INFLAMMATION AND BELLY FAT

Several studies have investigated the effects on emerging risk factors for cardiovascular disease such as inflammation and abdominal (belly) fat. One randomized controlled crossover feeding study assessed the effects of almonds on markers of inflammation in 25 healthy adults (ages 22 to 53). Participants were fed three different diets for four weeks each: a heart-healthy control diet (no nuts, <30% of calories from fat), a moderate-almond diet (10% of calories from almonds) and a high-almond diet (20% of calories from almonds).[14] E-selectin (an inflammation marker) decreased as percentage of energy from almonds increased. C-reactive protein (another inflammatory marker) was lower in both almond diets compared to the control diet, and E-selectin decreased as percentage of energy from almonds increased. While not all markers of inflammation were improved, these findings suggest including almonds in a heart-healthy diet may help improve two important markers, C-reactive protein and E-selectin, and in turn, contribute to the prevention of heart disease.

In another study, 30 normal-weight Iranian men with mildly elevated cholesterol consumed 60 grams of almonds daily for four weeks in addition to their usual diets. After four weeks, eating almonds significantly decreased total and LDL cholesterol, as well as apolipoprotein B100, a protein that plays a role in moving cholesterol throughout the body, and a form of LDL cholesterol.[15] ApoB 100 is thought to be an important determinant of cardiovascular risk. Almond consumption was also associated with an improvement in lipid oxidation parameters, suggesting that almonds may reduce the ability of fats to become oxidized in the body, a process that can lead to increased heart disease risk.

Figure 3: Effects of eating 1.5 ounces of almonds per day compared to 150-calorie muffin on lipid profiles in adults with high cholesterol from baseline to six weeks



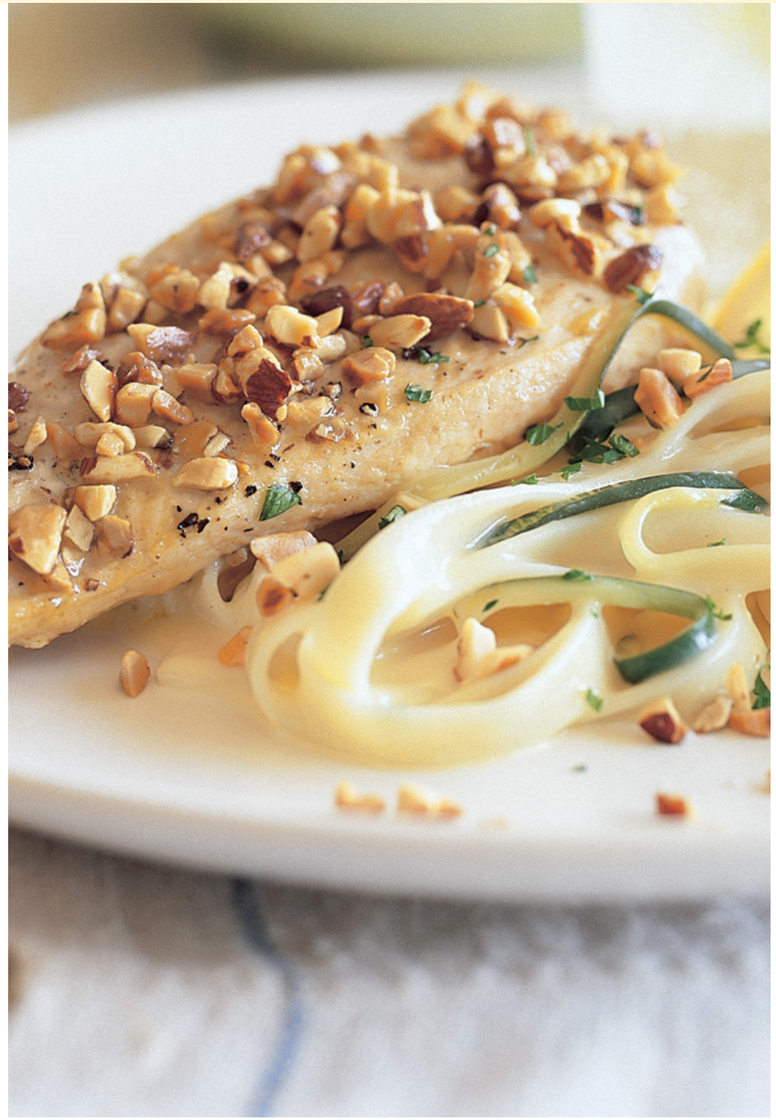
Data is mean ± standard error, n = 48.

A study from Penn State University (US) showed that snacking on almonds daily for six weeks not only reduced LDL and total cholesterol but also reduced abdominal fat and waist circumference in study participants.[16] During this study, 52 adult participants (who were overweight with elevated LDL and total cholesterol but otherwise healthy) ate standard healthy diets that were identical except for the snack, either 43 grams of almonds or a high-carbohydrate muffin with the same number of calories. Compared with snacking on muffins, eating almonds significantly decreased total cholesterol (-5.1 mg/dL) and LDL cholesterol (-5.3 mg/dL) and maintained HDL cholesterol. HDL cholesterol actually decreased among participants in the muffin group. (See Figure 3.) There was a small weight loss in both groups that did not differ between the diets, but snacking on almonds actually reduced abdominal fat (-0.7kg) and waist circumference (-0.8cm) compared with snacking on muffins. The overall diets were not matched for macronutrient content. The study suggests that regularly choosing almonds instead of a high-carb snack may be a simple dietary strategy to help improve body composition.

CONCLUSIONS

Dietary changes are often the first and one of the most effective ways to reduce the risk of cardiovascular disease, and the current body of research suggests that eating almonds can help maintain a healthy heart and healthy cholesterol levels.

ALMONDS AND DIABETES



THE UNIQUE NUTRIENT PACKAGE IN ALMONDS MAKES THEM A SMART CHOICE FOR MANAGING HEALTHY BLOOD SUGAR LEVELS.

The prevalence of type 2 diabetes is rapidly increasing. There are about 60 million people with diabetes in Europe or about 10.3% of men and 9.6% of women aged 25 years and over. Worldwide, it is projected that diabetes deaths will double between 2005 and 2030.[17] Diabetes is also a contributing risk factor for other chronic diseases, such as heart disease and stroke. Dietary and lifestyle interventions are a critical component of diabetes management, and evidence continues to mount supporting the role of almonds and other tree nuts as part of an overall dietary pattern that is beneficial for those with type 2 diabetes. The nutrient profile of almonds—low-glycaemic index and providing a satisfying combination of protein (6 grams per 28g), fibre (4 grams per 28g) and monounsaturated fats—makes them an ideal snack and addition to meals for individuals with impaired glucose intolerance or type 2 diabetes.

Many randomized controlled studies have been conducted to examine eating almonds in relation to blood glucose control. These studies were conducted in different population groups, including people with normal blood glucose control, people with prediabetes and people with type 2 diabetes (T2D).

IMPACT OF ALMONDS IN PARTICIPANTS WITH TYPE 2 DIABETES

A number of randomized, controlled studies of the effects of almonds on measures related to blood glucose control have been conducted in participants with T2D, evaluating both post-meal effects and longer-term measures (over at least four weeks). In four of the five longer-term studies, eating an almond-enriched diet resulted in significant reductions in fasting glucose and insulin levels control, when compared to an almond-free diet. One randomized trial in 19 U.S. adults (including 7 with T2D) reported a 30% reduction in postprandial glycaemia in participants with T2D following the consumptions of a test meal containing 28 grams of almonds compared to an almond-free test meal similar in calories, fat and available carbohydrate, although the effect was not significant in those without T2D.[18] These same researchers conducted a pilot study on the longer-term effects of almonds on glucose control in 13 adults with T2D. Participants consumed a daily 28g serving of almonds (five days per week for 12 weeks) or a cheese snack with the same number of calories. After 12 weeks, haemoglobin A1c in individuals with T2D was reduced by 4% in participants who consumed almonds daily compared to baseline.

Another 10-week crossover trial in 20 Chinese adults with T2D and mild hyperlipidemia (9 male, 11 female: age 58 years; BMI 26kg/m2) investigated the effects of a four-week diet containing 56 grams of almonds per day versus a no-almond control diet.[19] The study demonstrated that almond consumption helped improve glycaemic control by lowering fasting insulin and fasting glucose as well as decreasing the risk for heart disease through significant reductions on total cholesterol (-6%), LDL cholesterol (-11.6%) and LDL: HDL ratio when compared to the control. In a third long-term study, participants (65 overweight and obese adults) consumed 85 grams of almonds per day as part of a healthy diet for 12 weeks and showed improvements in HbA1c.[20]

Finally, a recent six-month study among 50 Asian Indians with T2D and elevated cholesterol examined the effect of almonds on CVD risk factors.[21] During a three-week run-in period, participants ate a standard diet compliant with the dietary guidelines for Asian Indians and appropriate for diabetes. During this period, participants were also asked to walk for 45 minutes at least five days a week to standardise their physical activity and were instructed to maintain

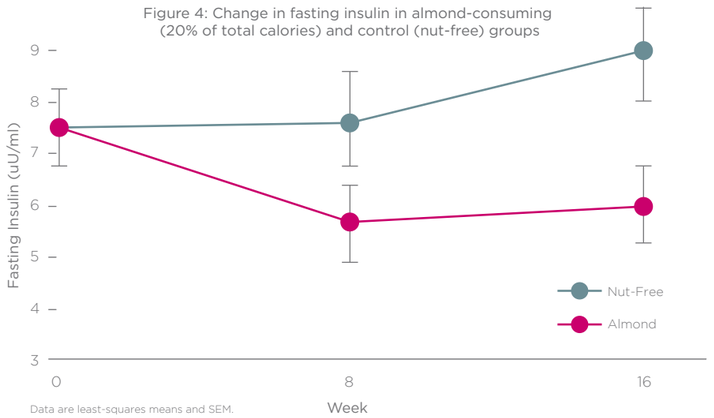
the same level of activity for the rest of the study. Whole natural unroasted almonds (20% of energy intake) were substituted for fat (such as cooking oil and butter) and some carbohydrates in the intervention group. Following the almond intervention, waist circumference, waist-to-height ratio, total cholesterol, triglycerides, LDL cholesterol, C-reactive protein (an indicator of inflammation) and haemoglobin A1C (an indicator of long-term blood sugar control) improved in participants. The study findings illustrate that incorporation of almonds in a well-balanced healthy diet leads to multiple beneficial effects on glycaemic and cardiovascular risk factors.

The summary of these results suggests that modest almond consumption improves both short-term and long-term markers of glucose control in individuals with T2D. The studies were well controlled and of sufficient duration to determine effects on glycaemic control; they are limited by their small sample size and the fact that, in some cases, participants had free-living conditions in the studies in which meals were provided.

ALMONDS AND PREDIABETES

Studies also suggest that almonds may have benefits for people with prediabetes. One short-term post-meal study in 14 adults with impaired glucose tolerance showed that the consumption of a 580-kcal breakfast meal containing 44.5 grams of almonds resulted in significant reductions in study participants' blood glucose levels both acutely after breakfast and after a second meal relative to the consumption of a 347-kcal control breakfast meal, which differed in total dietary energy but provided the same amount of available carbohydrate.[22] A long-term 16-week randomized control trial on 65 middle-aged U.S. adults (48 women and 17 men) with prediabetes investigated the effects of consuming an American Diabetes Association diet consisting of 20% of calories from almonds (approximately 57 grams per day) on the progression of T2D and CVD. The group that consumed the almond-enriched diet showed significantly improved LDL cholesterol levels and measures of insulin sensitivity, both of which are risk factors for heart disease and T2D.[23] (See Figure 4.) The study was of sufficient duration to examine effects on markers of long-term blood glucose control; however, reliance on a single fasting sample for measurement of insulin resistance is an analytical limitation.

Figure 4: Change in fasting insulin in almond-consuming (20% of total calories) and control (nut-free) groups



Data are least-squares means and SEM.

EFFECT OF ALMONDS ON BLOOD GLUCOSE MEASURES IN HEALTHY PEOPLE

Post-meal studies conducted in healthy or hyperlipidemic participants with normal blood glucose control cumulatively suggest that almonds have neutral or beneficial effects on post-meal blood glucose and insulin responses; in some studies, almonds actually reduced post-meal blood glucose and insulin spikes as well as blood glucose and insulin levels over a two-hour time period relative to an almond-free meal.[24,25]

In longer-term four-week studies, eating about 35 or 70 grams of almonds per day resulted in significant reductions in a marker of insulin secretion, suggesting a decrease in insulin resistance[26] as well as significant dose-dependent improvements in total cholesterol and other blood lipids.[27] Calorie intake was similar between the control and almond diets in both studies, but the duration was too short to discern effects on long-term blood glucose control.

CONCLUSIONS

Based on the totality of scientific evidence from randomized controlled studies, almonds, when eaten as part of a healthy diet, may have beneficial effects on blood glucose and insulin responses, both in the short term after consuming a meal and over the longer term, especially in those with impaired glucose tolerance and/or T2D. Dietary changes are often the first and one of the most effective ways to manage diabetes, and the body of research suggests that eating almonds can help maintain healthy blood sugar levels.

ALMONDS: A SATISFYING WEIGHT-WISE SNACK

A DAILY HANDFUL OF ALMONDS IS A DELICIOUS WAY TO MANAGE CRAVINGS AND HELP MAINTAIN A HEALTHY BODY WEIGHT.

The prevalence of excess weight and obesity continues to be a major public health issue worldwide. Weight problems and obesity are increasing at a rapid rate in most of the EU Member States, with an estimated of 51.6 % of the EU's population (18 and over) being overweight in 2014.[28] Given that snacking has become nearly universal behavior, with an estimated 94% of Americans reporting snacking at least once a day[29] combined with persistently high obesity rates, identifying nutrient-rich snack options that pose little risk for weight gain is of growing importance. The nutrients in almonds, including monounsaturated fat (13 grams per 28g) and fibre (4 grams per 28g), are associated with improved satiety, suggesting they would be an ideal snack for those concerned about weight management.

New data from the U.S. Department of Agriculture (USDA) shows that both roasted and unroasted almonds provide fewer calories than thought—and that the number of calories is largely dependent on form.[30] (See Figure 5.) The study, conducted by scientists from USDA's Agricultural Research Service (ARS) and jointly funded by Almond Board of California and USDA ARS, shows that compared to the number of calories listed on nutrition labels, participants actually absorbed 25% fewer calories from whole unroasted almonds, 19% fewer calories from whole roasted almonds and 17% fewer calories when almonds were roasted and chopped. Measured calories in almond butter did not differ from calories listed on labels. Much of this finding has to do with particle size after chewing and digestion. The larger the particle size, after chewing for example, the less the almond is able to be broken down by digestive enzymes and more of the almond is excreted, so fewer calories are absorbed. The reverse is also true: the smaller the particle size, the more almond cells are exposed to digestive enzymes and the more calories are absorbed. In addition to chewing and digestion, mechanical processes, such as chopping, grinding and roasting almonds can also impact particle size.

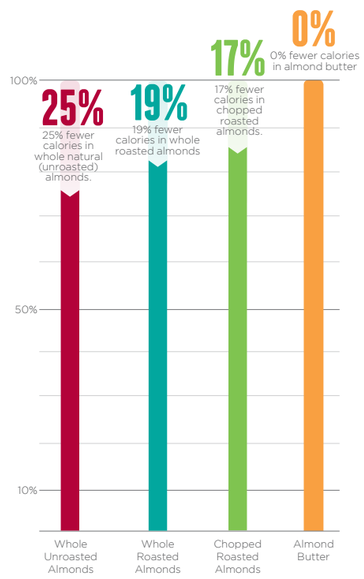
Further research is needed to better understand how this technique for calculating calories could potentially affect the calorie content of other foods.

Many randomized controlled studies have been conducted to examine the effects of almonds, consumed as part of a sensible eating plan, on outcomes related to satiety (like hunger, fullness, desire to eat and prospective food consumption) and/or body composition (like body weight, body mass index (BMI), body fat and waist circumference). These studies were conducted in different population groups, including people with normal weight, as well as overweight or obese people.

IMPACT OF EATING ALMONDS ON MEASURES OF HUNGER, SATIETY AND SUBSEQUENT CALORIE INTAKE IN NORMAL-WEIGHT PEOPLE

In post-meal studies, the daily consumption of almonds is associated with improving ratings of hunger and satiety in healthy people. In one study, the daily consumption of 80.4 grams of almonds reduced subjective rating of hunger[31] and a second study investigated the effects of two different portion sizes of almonds (28 and 43 grams) as a midmorning snack on satiety and energy intake, in comparison to having no snack. (See Figure 6.) There were no significant differences in total daily energy intake between any of the groups, indicating that participants 32—healthy, Caucasian women—naturally compensated for the almond calories consumed, whether they had one (160 calories) or 1.5 servings (250 calories) of almonds as the mid-morning snack.[32] After eating their usual breakfast and having the mid-morning almond snack, participants were fed lunch midday and permitted to eat as much as they wanted until they were comfortably full. Ratings of appetite and fullness were dose-dependent, with participants reporting being the least hungry when they ate 43 grams of almonds and the hungriest on the day when they didn't eat almonds. Although habitual almond intake was not controlled and a control snack was not tested, the studies suggest that snacking on nutrient-rich almonds may improve satiety and help control cravings.

Figure 5: Food processing and structure impact the metabolizing energy of almonds.



A longer-term four-week randomized, controlled clinical study in which 137 adults who were at risk of T2D but otherwise healthy were given 43 grams of almonds as a snack or with meals also showed significantly greater reductions in daylong ratings of hunger and desire to eat in participants who consumed almonds either as a snack or as part of a meal relative to those who did not consume almonds.[33] Despite consuming approximately 250 calories from almonds every day for over four weeks, participants did not increase their daily total calorie intake or experience any change in weight over the

Figure 6: A midmorning snack of almonds generates satiety

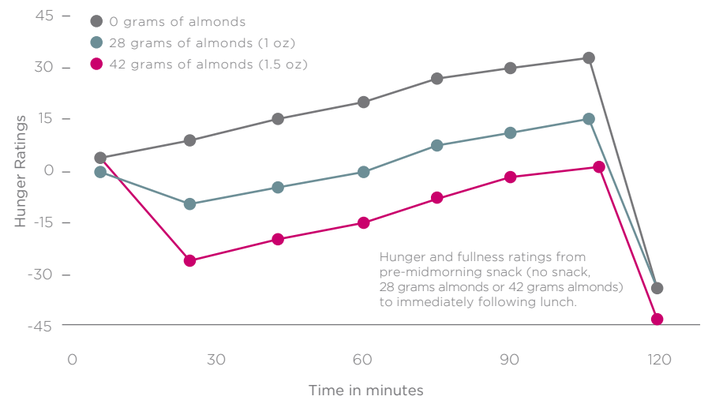
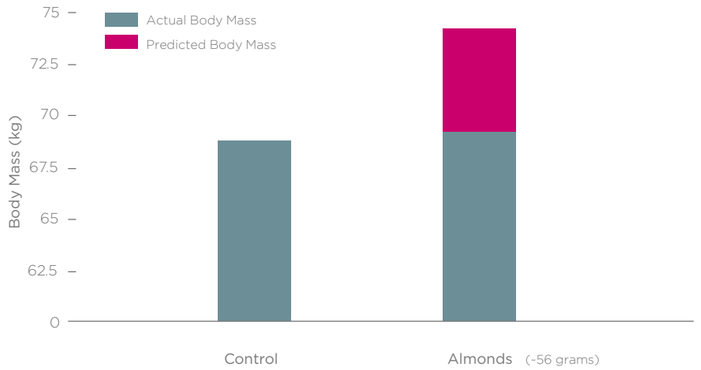


Figure 7: Changes in body composition due to the consumption of 344 calories per day of almonds for 10 weeks in healthy adult women (n = 20)



course of the study. Although the study was of relatively short duration, these findings suggest almonds may be a satisfying snack option to help maintain a healthy weight.

In another 10-week study, 20 healthy adult women consumed their normal diets plus 344 calories (approximately 56 grams) of almonds per day for 10 weeks and then followed their normal diet without almonds for 10 weeks, with a three-week washout period in between (See Figure7.)[34] There were no differences in body weight, metabolic rate or energy expenditure observed, suggesting that the almonds replaced other foods in the diet and, therefore, did not increase overall calorie intake.

EFFECTS OF EATING ALMONDS ON SATIETY AND WEIGHT IN PEOPLE WHO ARE OVERWEIGHT OR OBESE

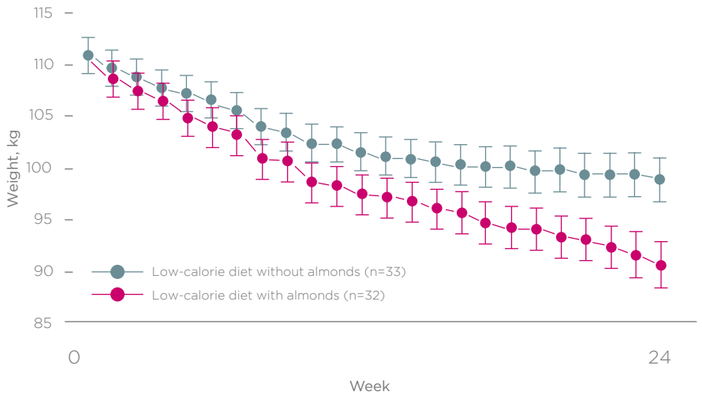
There have been a number of studies investigating the short-and long-term effects of almonds on measures related to body composition and weight in overweight and obese adults (BMI ≥ 25 kg/m2). In one study, overweight women who consumed a meal containing 28 grams of almonds reported feeling more hungry, less full, more desire to eat, with a greater food consumption later in the day relative to when they consumed a control meal containing a mixture of safflower and corn oils, although differences in satiety ratings were not observed in overweight men.[35] In another study conducted in obese adults, the consumption of a meal containing 43 grams of almonds boosted fullness ratings in the afternoon and throughout the day relative to the consumption of a control meal without almonds, which was lower in total dietary energy but provided the same amount of available carbohydrate.[36]

Long-term studies cumulatively suggest that almonds have no detrimental effects on body composition in overweight or obese participants; in fact, significant improvements in body composition have been observed in two studies.

In obese adults with type 2 diabetes, the consumption of 28 grams of almonds five days per week for 12 weeks resulted in a significant decrease in BMI relative to no almond consumption.[37] In another study, 65 overweight and obese participants who consumed 84 grams of almonds daily for 24 weeks had significantly greater reductions in body weight, BMI, waist circumference, fat mass and total body water compared to participants who did not consume almonds.[38] (See Figure 8.) These findings are remarkable, given that participants consumed the almonds as part of a healthy low-calorie diet.

Another 18-month clinical trial examined the effects of a low-calorie diet containing 56 grams per day of almonds compared to a low calorie, nut-free diet on weight loss and heart disease risk factors in 123 overweight or obese adults. Although both groups had lost similar and significant amounts of weight after 18 months, compared with the nut-free group, the almond-enriched diet was associated with greater reductions in total cholesterol, TL:HDL ratio, and triglycerides.[39] Strengths of the long-term studies include sufficient study duration to discern the effects on body weight and adequate control of the total energy intake between the control and almond diets. The studies are limited by inadequate control of the confounding effects of physical activity.

Figure 8: Weekly change in body weight in low-calorie diet with almonds vs. low-calorie diet without almonds



CONCLUSIONS

The body of scientific evidence suggests that despite their relatively high energy density, almonds, when eaten as a part of a healthy diet, do not cause weight gain and may even have beneficial effects on body composition, especially in overweight or obese adults. Several mechanisms give explanation for the positive associations between almonds and other nuts and energy balance and body weight, including their strong satiety effects, incomplete calorie availability and possible enhancement of resting energy expenditure.[40] Although many commonly consumed snacks provide empty calories, almonds are a healthy, nutrient rich snack choice. The unique nutrient package in almonds makes them a satisfying, weight-wise snack.

ALMONDS AND DIET QUALITY

The 2015 Dietary Guidelines for Americans recommend improving diet quality; and one way to do this is by replacing high-calorie snacks with nutrient-rich options, and this advice has relevance to other Western diets. A recent study that evaluated the potential effects of replacing typical snack foods with almonds and other tree nuts shows that this simple swap would decrease empty calories, solid fats, saturated fat and sodium in the diet, while increasing intake of key nutrients.[41] Using data of more than 17,000 children and adults from the US National Health and Nutrition Examination Survey (NHANES; 2009–2012), the researchers applied food pattern modeling to assess the hypothetical impact of replacing all snack foods, excluding beverages, with tree nuts (model 1) and replacing all but "healthy" snack foods (whole grains, whole fruits and non-starchy vegetables) with tree nuts (model 2). Almonds are the most frequently consumed nut in this study, 44% of all tree nuts eaten were almonds. Therefore, assessments using the NHANES data were repeated using almonds only. All reported snacks were replaced calorie for calorie with almonds or other tree nuts, reflecting typical American consumption patterns. The Healthy Eating Index 2010, which measured adherence to the 2010 Dietary Guidelines for Americans, was used to assess diet quality.
In both models examined, where tree nuts hypothetically replaced all snack foods and where tree nuts hypothetically replaced only less-healthy snack foods, consumption of empty calories, solid fats, saturated fat, sodium, carbohydrates and added sugars all declined, while consumption of oils and good fats increased significantly. Fibre and magnesium also increased, while protein increased by a small margin. The findings were the same in the almond-only model.

This study echoes findings from a similar NHANES analysis on almond eaters, which examined the characteristics of almond eaters. It found that people who reported eating almonds had higher intake of key nutrients (such as dietary fibre, calcium, potassium and iron, as well as higher intakes of several other "shortfall nutrients," including vitamins A, D, E and C; folate; and magnesium), better overall diet quality (measured by Healthy Eating Index scores) and lower body mass index and waist circumference compared to non-consumers.[42] Almond consumers (defined as those eating about 28 grams per day) also tended to be more physically active and less likely to smoke than their non-almond-eating counterparts, suggesting that including almonds as a regular part of the diet is associated with a portfolio of healthy lifestyle attributes.

Another study on diet quality conducted by the University of Florida examined the impact of eating almonds and/or almond butter for three weeks on diet quality in addition to microbiota composition in 29 parents and their children. Participants ate either 43 grams of almonds and/or 14 grams of almond butter on a daily basis for three weeks, as part of their usual diet. This was followed by a four-week washout period and a three-week control period in which no almonds were eaten.

Diet quality was assessed based on the U.S. Dietary Guidelines. When parents and children ate almonds, their overall diet quality improved, as measured by an increase in Healthy Eating Index (HEI) scores (a standard measure of adherence to recommended dietary guidance).[43] Specifically, parent and child scores increased for fatty acids, total protein, seafood and plant protein, and decreased for fruit and empty calories. In addition, when eating almonds, participants also consumed significantly more vitamin E and magnesium, two nutrients commonly underconsumed by the majority of adults and children. Although no specific changes in immune markers were observed, almond consumption did result in detectable changes in gut microbiota. More research is necessary to understand these changes and their potential health impacts.

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Document #2015HP0007

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