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In addition to summarizing articles from scientific peer-reviewed journals, Bean Briefs highlights news and research about beans and health.

Effect of dietary pulses on blood pressure: a systematic review and meta-analysis of controlled feeding trials

Jayalath VH, de Souza RJ, Sievenpiper JL, et al
American Journal of Hypertension 2014; 27:56-64.

Research confirms that tackling high blood pressure with diet can lower blood pressure in people with hypertension. The DASH diet (Dietary Approaches to Stop Hypertension), which includes beans and other legumes, has yielded positive results. In fact, the United States, Canada, and Europe all recommend similar diet and lifestyle changes, including increased bean intake, as primary treatment for high blood pressure. In this study, researchers set out to evaluate data on whether dietary pulses (low-fat beans, peas and lentils), by themselves, can lower blood pressure.

The researchers combined the results of eight trials of more than 500 participants, almost half of whom were overweight or obese, and who were followed for a median of 10 weeks. All of the trials substituted pulses calorie-for-calorie in the participants' diets. The results demonstrated that the median intake of 1 2/3 servings daily (slightly less than one cup) significantly lowered systolic blood pressure by 2.25 mm HG in participants with and without hypertension.

Why are beans likely to be helpful in lowering blood pressure? The researchers point to beans being high in fiber, potassium, and plant protein, all of which have shown the ability to help lower blood pressure, while also having a low glycemic index and saturated fat content.



TAKE-HOME BEAN MESSAGE:

Consistently eating a cup of beans a day may be able to make a significant dent in blood pressure, whether someone is hypertensive or pre-hypertensive. This plus other dietary and lifestyle changes might be enough to supplement or replace medication.



Lifestyle factors and mortality risk in individuals with diabetes mellitus: are the associations different from those in individuals without diabetes?

Sluik D, Boeing H, Li K, et al
Diabetologia 2014; 57: 63-72.

Diet and lifestyle recommendations for people with diabetes have evolved over the years. In December 2013, the American Diabetes Association updated its nutrition therapy guidelines to promote healthful eating patterns that address individual needs and maintain the pleasure of eating. But should nutrition advice for people with diabetes differ from advice for the general population? This European research team sought to find that out.

The European Prospective Investigation into Cancer and Nutrition (EPIC) is an ongoing large-scale, prospective study being conducted at centers in 10 European countries. To determine whether people with diabetes might benefit more than others from adopting a healthy lifestyle, EPIC researchers examined the records of 6,384 people with diabetes and 258,911 participants not known to have the disease. Among the data they compared between the two groups were BMI and waist/height ratio, intake of 26 different food groups as gathered from food frequency questionnaires (FFQs) and 24-hour dietary recalls, alcohol consumption, smoking, and leisure time activity. They noted the duration of diabetes, insulin regimen and, where applicable, date of death.

Diet affected mortality risk, which was lower among those with and without diabetes who ate higher amounts of beans, fruits, nuts and seeds, pasta, poultry, and vegetable oil. The association was strongest among those with diabetes. The authors conclude that while certain types of foods might benefit people with diabetes, they also benefitted those without the disease. Therefore, lifestyle advice should be similar for those with and without diabetes.



TAKE-HOME BEAN MESSAGE:

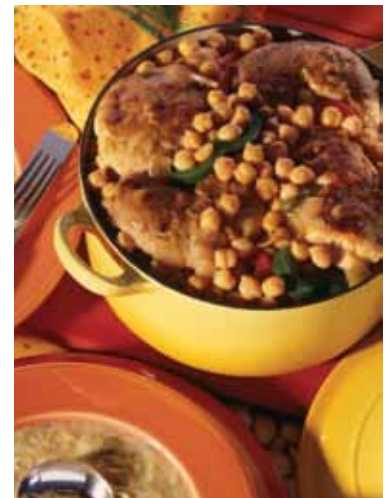
Beans and other plant foods contain vitamins, fiber, unsaturated fats, and other bioactive compounds that appear to help protect health. The numerous benefits include improvements in glucose tolerance and insulin response that reduce the consequences of diabetes, by lowering blood pressure and blood lipids to protect heart health, and reducing oxidative stress and inflammation.

Antidiabetic potential of commonly consumed legumes: a review.

Singhal P, Kaushik G, Mathur P
Critical Reviews of Food Science and Nutrition 2014; 54: 655-72.

Nutrition and lifestyle approaches are highly effective for both treating diabetes and delaying its onset. In particular, global recommendations often suggest adopting a low-glycemic index (GI) diet that includes foods such as beans and whole-grain cereals. Beans are important to diets around the world because of their density of nutrients and affordability, and may offer additional value for controlling and preventing diabetes and heart disease. This paper reviews the antidiabetic properties of several varieties of beans typically present in a traditional Indian diet, including several that also are widely consumed in the U.S.

Animal and human studies support the association between chickpeas (also called Bengal grams in India and garbanzo beans in the U.S.) and lowering of blood glucose, total and LDL cholesterol and triglycerides. Researchers surmise that the chickpea contains several bioactive compounds, including plant protein, fibers, and the phytochemicals saponins and isoflavones. Lentils have been the subject of a small number of human studies, where they have been shown to lower blood glucose after a breakfast meal, and, when combined with canola oil, to lower blood glucose and total cholesterol as compared to a bread and cheese meal. Adzuki beans and kidney beans have not been studied extensively in humans but research suggests that they offer similar benefits.



TAKE-HOME BEAN MESSAGE:

While bean varieties differ in their nutrient and phytochemical content, as well as in their appearance, flavor, and culinary uses, they appear to share similar health benefits in helping lower blood glucose, total cholesterol, LDL cholesterol, and triglycerides. Additionally, substituting beans for meat or other animal proteins decreases dietary fat and cholesterol while adding fiber, magnesium, and other beneficial nutrients.

A review of the nutritional value of legumes and their effects on obesity and its related comorbidities

Rebello CJ, Greenway FL, Finley JW
Obesity Reviews 2014: [Epub ahead of print].

The recent rise in overweight and obesity now threaten to affect three-quarters of Americans by 2020. In this review article, the authors propose that small lifestyle changes are easier and typically more long-lasting than dietary overhauls that cannot be maintained long-term. One of these small changes involves eating more legumes. Research shows that the higher the legume consumption in a population, the lower the average weight of participants. Not only are beans nutritious, versatile, and able to battle weight gain, but they are a familiar low-cost ingredient to a low-income population that has a particular problem with overweight.

Most accepted lifestyle eating plans recommend eating beans, including the Mediterranean and DASH diets. What do beans bring to the table? The researchers exhaustively document all the positive characteristics of beans and other legumes that make them appealing to help battle both weight gain and the diseases that coexist with overweight and obesity.

Because they are high in fiber, beans have a lower energy density (more nutrients for fewer calories) and can improve glycemic response, evening out blood glucose levels. Fiber also helps boost satiety. Moreover, beans are rich in protein while also being low in fat. They shine in much-needed folate for women, as well as other B vitamins. In addition, they provide important minerals, especially magnesium and potassium, but also iron and calcium. The high potassium benefits blood pressure.

Phytochemicals abound, including polyphenols, phytic acid, and saponins, which carry antioxidant and anti-inflammatory properties. Research suggests some anti-cancer and cholesterol-lowering potential of certain phytochemicals. Beans are rich in the newly appreciated fiber called resistant starch. This may help body weight management by lowering glycemic response and improving insulin resistance.



TAKE-HOME BEAN MESSAGE:

The small act of eating more beans not only improves a diet, but helps prevent weight gain. Much of this is attributed to beans' abundance of fiber, particularly resistant starch. People who incorporate beans into meals are likely to be more satisfied, less likely to gain weight, and eating a more nutritious diet that helps keep other conditions at bay.

Legumes and meat analogues consumption are associated with hip fracture risk independently of meat intake among Caucasian men and women: the Adventist Health Study-2

Lousuebsakul-Matthews V, Thorpe DL, Knutsen R, et al
Public Health Nutrition 2013; 8:1-11 [Epub ahead of print].

Scientists continue to debate the relationship between protein intake and risk of hip fracture, as past research has been equivocal. Previous studies of legumes and fracture risk, in particular, have not found an association. However, researchers suggest that this could be due to the low amount of legumes eaten in the populations previously studied.

In contrast, half of the participants in this study were vegetarians, and they ate larger than typical amounts of legumes, making any effect on fractures easier to detect statistically. This comprehensive prospective study surveyed more than 58,000 participants every two years to investigate the relationship between several diseases and lifestyle factors, including diet.

The results found that as overall protein intake increased, bone fracture risk decreased, no matter the protein source. But while the intake of legumes, meat, and meat analogues all were independently and significantly protective against hip fractures, there was a difference in how protective each was. Legumes were linked to a 64% reduction in risk, with meat analogues (soy protein) at 49%, and meat 40%.



TAKE-HOME BEAN MESSAGE:

Beans may help protect bones from breakage. This study found all protein sources were protective, but the top results came from legumes. Study participants who fared the best were those who ate beans or other legumes once a day or more. Bottom line? Beans and better bones—a winning combo.

Nutrient profiles of vegetarian and nonvegetarian dietary patterns

Rizzo NS, Jaceldo-Siegl K, Sabate J, et al
Journal of the Academy of Nutrition and Dietetics 2013; 113: 1610-19.

Research shows that vegetarian diets and diets with low amounts of animal protein are associated with lower risk of chronic disease, including diabetes, heart disease, some forms of cancer, and metabolic syndrome. However, the definition of a vegetarian diet varies from person to person and often includes occasional animal products such as dairy, eggs, fish, and even meat and poultry. With its 96,000 participants, of whom 45% are vegetarian, the Adventist Health Study 2 is among the best resources for evaluating the spectrum of vegetarian diets, their nutrient content, and their link to health.

This study examined a cross-section of nearly 72,000 U.S. and Canadian participants who filled out self-administered food frequency diet questionnaires (FFQ) over a five-year period. The research team identified five different dietary patterns: (1) non-vegetarians, who eat meat or fish at least once per week; (2) semi-vegetarians, who include dairy and eggs and also eat meat and/or poultry plus fish at least once per month but less than once per week; (3) pesco vegetarians, eating fish at least once per month but limiting other animal products; (4) lacto-ovo vegetarians, who have meat, poultry, and/or fish less than once per month; and (5) strict vegetarians, and compared nutrient intakes, as well as BMI and obesity rates, among the groups.

All five groups had similar calorie intakes, with the exception of semi-vegetarians, who ate fewer calories. Average BMI and obesity rates varied, with nonvegetarians at the highest levels and strict vegetarians at the lowest. Intakes of plant protein, fiber, and magnesium were lowest in non-vegetarians; diet content of all three nutrients generally increased with the degree of vegetarianism.



TAKE-HOME BEAN MESSAGE:

Although beans were not specifically called out in the dietary patterns, intake of nutrients associated with beans, namely plant protein, fiber, and magnesium, increased as diets contained greater proportions of plant-based and lesser proportions of animal-based foods. Furthermore, iron intake remained steady across all diets, suggesting that beans may serve even as a partial replacement for the iron in meat and other animal proteins.

Daily non-soy legume consumption reverses vascular impairment due to peripheral artery disease

Zahradka P, Wright B, Weighell W, et al
Atherosclerosis 2013; 230:310-14.

Atherosclerosis is a pervasive problem among Americans, and peripheral artery disease (PAD) is a less well-known side effect of the disease, affecting 20% of people over 60 years of age. Atherosclerosis causes stiffness of arteries, which can reduce blood flow to the legs, causing a drop in ankle blood pressure and much discomfort and loss of quality of life. More importantly, it is a predictor of a high risk of death from both heart disease and stroke.

Previous studies show that changes in diet can improve arterial stiffness. Population studies link a high legume intake with less atherosclerosis, thought to be due to legumes' high fiber content and low glycemic index. But no research has yet studied whether legumes affect arterial stiffness in particular. This clinical trial sought to study the effect of non-soy legumes on people with PAD, as measured by ankle-brachial index (ABI), a standard diagnostic marker.

The eight-week study involved 26 participants over the age of 40. They ate a diet containing mixed non-soy legumes (1/4 cup a day in week one; 1/2 cup daily thereafter). The results were impressive, with improvement in two PAD-related parameters: ABI and blood cholesterol levels. ABI right and left ankle measures increased 4% and 7%, suggesting improved blood flow to the legs, while total cholesterol declined 5%, LDL-cholesterol 9%, and Lp(a) 12%. Furthermore, the two parameters did not correlate with one another, suggesting that lipid levels were not responsible for the improvement in ABI. The researchers did detect altered acyl-carnitine levels in the bean eaters, which indicate improvement in skeletal muscle metabolism as a result of increased blood flow.

Because beans appear to independently affect both ABI and cholesterol in positive ways, the research team suggests that components in beans other than fiber are responsible for the ABI effect.



TAKE-HOME BEAN MESSAGE:

Beans bestow benefits beyond what has already been suggested by their high fiber content. One of those might be an increase in blood flow to the legs, improving peripheral artery disease. That gives one more reason to eat beans regularly, for their richness in fiber, protein, folate, potassium, and as yet unknown phytochemical constituents.

Combining functional features of whole-grain barley and legumes for dietary reduction of cardiometabolic risk: a randomised cross-over intervention in mature women

Tovar J, Nilsson A, Johansson M, Björck I.

British Journal of Nutrition 2013;111:706-14.

The relationship between diet and reduced risk of heart disease is well established. Additionally, individual plant-based foods such as beans, whole grains, soy, and nuts have been shown to help lower blood cholesterol levels and improve other cardiovascular risk factors. Earlier research on brown beans and chickpeas suggests that their mechanism of action also involves reducing inflammation biomarkers, lowering glycemic index of a meal and serving as prebiotics for beneficial bacteria in the GI tract.

This randomized, cross-over study evaluated the impact of a diet with brown beans, chickpeas, and whole grain barley on heart disease risk factors in a group of 46 overweight, otherwise healthy non-smoking middle-aged women. BMIs ranged from 25 to 33. Participants followed each of two diets for four weeks, with a wash-out period of neither diet in between. The test diet contained canned brown beans and chickpeas, whole-grain barley, and a whole-grain barley bread. These foods were replaced with high-fiber foods in the second "regular" diet. During each visit, participants completed a questionnaire that, among other items, asked them to compare satiety between the test diet and regular diet. The research team measured body weight, blood pressure, blood glucose, fasting insulin, glycated hemoglobin, cholesterol, and other parameters.

A higher percentage of participants reported that the bean and barley test diet was more satiating than the regular diet. While both diets lowered total and LDL cholesterol and apoprotein B, the bean diet had a greater effect. The bean diet also reduced diastolic blood pressure, lowered overall cardiovascular risk score, and decreased the enzyme GGT, an indicator of non-alcoholic liver disease that also is associated with diabetes and hypertension. Neither diet affected measures of glycemic control or the inflammation marker C-reactive protein.



TAKE-HOME BEAN MESSAGE:

Beans contain several functional components that may contribute to their protective benefits against heart disease. They have a low glycemic index, abundant digestible and non-digestible fibers, prebiotic resistant starch, polyphenols, and phenolic acids. Participants achieved cardiovascular benefits without losing weight; weight loss that results from increased satiety and therefore reduced calorie intake on a bean-containing diet might impart even greater health improvements.

Prospective study of dietary approaches to stop hypertension—and Mediterranean-style dietary patterns and age-related cognitive change: the Cache County Study on Memory, Health and Aging

Wengreen H, Munger RG, Cutler A, et al
American Journal of Clinical Nutrition 2013; 98:1263-71.

Cognitive decline is a pervasive problem of aging, one that may increase in magnitude as the baby boomer population ages. Researchers estimate that lifestyle changes with even modest effects could make a huge difference if doing so delays the onset of Alzheimer's Disease or other cognitive conditions by just a few years. While analyses of single nutrients have not proved fruitful, overall diet patterns may be more promising. To determine this, researchers looked at both a Mediterranean-style diet and the DASH diet (Dietary Approaches to Stop Hypertension) to detect any apparent effect of these eating patterns on cognitive function.

The researchers analyzed data from a large population-based prospective study that evaluated the prevalence and incidence of dementia in more than 5,000 elderly residents of a county in Utah. The study used information gleaned from food frequency questionnaires to determine how well participants adhered to Mediterranean or DASH diets. Legumes were noted as core components of both diets, along with other fruits and vegetables, grains, and fish.

The researchers found that those who adhered best to either a Mediterranean-style or DASH diet scored the highest on a standard assessment of mental health performed four times during the study. The differences noted were consistent over 11 years of follow-up. Most striking is that legumes by themselves were independently associated with higher mental health scores in the

Mediterranean-style diet eaters, and the same association held when grouped with whole grains and nuts for both diets. No other foods shared this same trend. This suggests that public health efforts might do best to center on promoting legumes and nuts as core beneficial components of both diets.



TAKE-HOME BEAN MESSAGE:

Eating more beans just may help keep mind and memory sharp longer. Beans are integral to the category of legumes and nuts, which emerged as most beneficial for protecting against cognitive decline in this large, 11-year study. Participants ate only about one cup of beans a week on average; those who ate more fared even better cognitively.

Effect of brown rice, white rice, and brown rice with legumes on blood glucose and insulin responses in overweight Asian Indians: a randomized controlled trial

Mohan V, Spiegelman D, Sudha V, et al
Diabetes Technology and Therapeutics 2014;16 [Epub ahead of print].

Obesity and diabetes are on the rise in India, as in many developing countries. Considering both the high carbohydrate content and prevalence of refined white rice in the Indian diet, this research team looked at the impact of substituting brown rice or brown rice plus beans for white rice in a South Indian-style test diet.

A group of 15 men and women, 25 to 45 years of age and with an average BMI of 27.4, followed one of three diets assigned in a randomized, crossover design: (1) white rice, (2) brown rice, or (3) brown rice plus 50 grams of beans. With the exception of the type of rice, the breakfasts and lunches were identical on each of the five-day diets and included a minimum 200 grams of rice total. Subjects ate their usual dinner. The research team monitored blood glucose on a 24-hour basis and blood insulin levels at the beginning and end of each test diet period; measured height, weight, and waist circumference; and calculated BMI. Participants completed a 24-hour dietary recall for each day on a test diet.

Study participants ate similar amounts of calories, carbohydrate, and protein and made similar food group selections on each of the three diets. The two brown rice diets were higher in fiber and had a lower glycemic index and load. All three diets were high in beans—1/2 to 2/3 cup per day—but a higher percentage were in the whole form on the bean diet and in the split form on the other two diets. Five-day glycemic response was lower on the brown rice diet and somewhat lower still with the addition of beans. Fasting insulin levels were similar on the two brown rice diets.



TAKE-HOME BEAN MESSAGE:

It is possible that the high bean content of the typical South Indian diet masked differences in blood glucose and insulin levels, particularly compared to the white rice diet. While whole beans may be somewhat more effective than split beans at blunting glucose response, all forms of beans contribute fiber and aid in the management of blood glucose levels.



What Researchers Are Talking About:

Presentations From the Experimental Biology Meeting in San Diego, April 2014

Here are several thought-provoking, bean-related research topics by Donna M. Winham, DrPH, and her colleagues, presented at this year's Experimental Biology meeting:

• Needed: Just the Facts on Beans Please

Many nutrition professionals are surprisingly misinformed about the functional health properties of certain foods, and perhaps also about the efficacy of medications. In a survey of nearly 500 of these practitioners (74% of whom were Registered Dietitians) in Arizona, about 30% ranked functional foods as more effective in their ability to lower cholesterol and control high blood glucose levels instead of the top-prescribed medications. Although foods should be the first-line approach, medications are the most effective. The practitioners were given a list of foods as well as either statins or metformin to rank in order of effectiveness at lowering LDL levels or blood glucose levels, respectively. Dietitians were more likely to rank the medications first, but a significant number of them put oatmeal ahead of beans for lowering cholesterol, even though beans are twice as effective. The researchers conclude that the nutrition community needs to reach out and educate not just the public, but practitioners as well, about the true efficacy of medications and some functional foods such as beans.

• Beans' Health Benefits Need Publicity

The health benefits of beans are largely unknown in the low-income Hispanic community, according to a survey of primarily low-income women of Mexican heritage. The women knew in a general way that beans are nutritious and filling. But they were not aware that beans could help lower cholesterol and control blood glucose levels, nor that beans offer potential anti-cancer protection.

• Misconceptions About Canned Beans Limit Consumption

Hispanic and low-income populations value the economic and health benefits of traditional foods like dry beans. However, it turns out that these attitudes about dry beans do not necessarily transfer to canned beans. The WIC (Women, Infants and Children) food assistance program recently added canned beans as a food package item because dry beans take time to cook and prepare, which is not always conducive to today's harried lifestyles. And yet, in a recent study of low income Hispanic women in nutrition assistance programs, only one-quarter of less acculturated women purchased the canned beans, compared to half of bicultural women and three-quarters of English-dominant or more acculturated women.

When the 443 low-income women in the study were then surveyed about their attitudes, half of them thought canned beans do not taste good (versus one-quarter and one-fifth of the other two acculturation level groups). Nearly half thought their family wouldn't eat them, one-quarter thought they weren't healthy, and two-thirds thought they contain preservatives.

The benefits of canned beans include a much reduced preparation time along with a long shelf life. And yet canned beans retain all the health benefits of dry beans, which require cooking. Industry standards have progressively reduced sodium in canned beans. Sodium can be further reduced by rinsing canned beans before using in a recipe. Educators need to better communicate the benefits of canned beans, while stressing the similarities to dry beans, to clear up misconceptions that prevent their use.



TAKE-HOME BEAN MESSAGE:

There is a demonstrated need for nutrition professionals to inform the public—and all practitioners—about the health benefits and ease of use of canned beans to erase several pervasive misconceptions. Not everyone is aware of the benefits of all beans, such as helping to lower cholesterol, control blood glucose, fend off cancer, and promote gut health. Just as many have no experience with canned beans and could use advice on how they can be healthful time-savers in the kitchen.



Emerging Bean Research from the Lab

Henry J. Thompson, PhD • Cancer Prevention Laboratory • Colorado State University, Fort Collins, CO

Henry J. Thompson, PhD, has been conducting bean research in lab animals, focusing on two related areas: the mechanisms behind the potential protective activity against breast cancer of the common bean, a family of beans that share similar geographic origins, and the differences in bioactivity among varied bean cultivars. Common bean originates from one of two areas: Middle (Latin) America (pinto, great northern, small red, pink, black, navy, small white) or the Andes (light red kidney, dark red kidney, white kidney or cannellini, cranberry).

In earlier research, Thompson and his team showed that increasing the proportion of cooked red beans in a test diet was associated with decreases in the incidence of cancer, number of tumors, and tumor size in laboratory rats ...

Thompson conducts his studies within the university's transdisciplinary Crops for Health® program, whose goal is to reduce chronic disease morbidity and mortality by improving staple crops such as beans. Thompson and colleague Mark A. Brick, PhD, of the Department of Soil and Crop Sciences at Colorado State, recently received a five-year NIH grant to study the disease-fighting activity of a type of common bean, the cannellini bean.

In earlier research, Thompson and his team showed that increasing the proportion of cooked red beans in a test diet was associated with decreases in the incidence of cancer, number of tumors, and tumor size in laboratory rats; diets with higher bean content also increased the time before tumors recurred. Plasma concentrations of glucose, insulin, insulin-like growth factor-1, C-reactive protein, and interleukin-6 fell proportionately to the concentration of beans in the diet. The team concluded that active compounds in beans induced tumor cell death (apoptosis) via the mitochondrial pathway.

The research team also examined the effects of bean intake on cholesterol levels and proteins in the liver that regulate lipid synthesis. In both rats and mice, incorporating beans into a test diet lowered total and LDL-cholesterol without adversely affecting HDL-cholesterol.

Thompson found that the white kidney bean, of Andean origin, is at least twice as bioactive as the Middle American navy bean. His team later demonstrated that total fiber and oligosaccharide content differed between the two cultivars and suggested that selective breeding might be used to increase the dietary fiber of beans.

Moving forward, Dr. Thompson and his Crops for Health colleagues plan to work to identify the mechanisms by which common bean varieties protect against breast cancer, as well as improve glucose tolerance and lipid metabolism.

The United States Dry Bean Council (USDBC) is a private trade association in the United States that represents growers, shippers and end users of U.S. edible dry beans. The USDBC promotes the use, consumption, and marketing of edible dry beans worldwide.



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