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BeanBriefs

Research / Update / Analysis

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In addition to summarizing articles from scientific peer-reviewed journals, this report highlights news and emerging research about beans and health, including two studies presented this past spring at Experimental Biology in Washington, DC (EB). EB is a scientific meeting featuring award lectures, symposia, and oral and poster sessions. Associated with the American Society for Nutrition and many other prestigious scientific organizations, EB is an important venue to preview the latest in nutrition research.

1 What's in the Legume Pipeline: Emerging Research News

The effect of whole pulses and their fractions on regulation of short-term food intake and metabolic control

Principal Investigator: G. Harvey Anderson, PhD, Department of Nutritional Sciences, University of Toronto

Obesity is increasing worldwide and is associated with the metabolic syndrome — a cluster of conditions occurring together, including insulin resistance, elevated blood glucose, increased lipid levels and high blood pressure.

The objective of this research is to examine the effect of legumes and their components on the regulation of blood glucose, satiety and short-term food intake. Additionally, the researchers will determine the effect of **prolonged** consumption of legumes on the regulation of blood glucose and food intake, on satiety hormones, and on blood cholesterol in overweight and obese subjects.

Results are expected to show that a meal of legumes and selected fractions prepared from legumes decreases appetite, reduces food intake and contributes to control of blood glucose, both after their consumption and even at later meals. Bottom line — the study aims to provide evidence that frequent consumption of legumes by overweight and obese persons improves regulation of blood glucose and appetite control and decreases blood cholesterol.

Take Home Message:

The ancient Greek philosopher Hippocrates stated, "Let food be thy medicine and medicine be thy food." He was on to something — imagine if we can take a bite out of obesity by simply making small changes, such as adding more legumes to our diet to control hunger and satiety. The evidence is mounting toward supporting such a theme!

Effects of pulse incorporation into the diet on components of the metabolic syndrome, body fatness and food habits in women

Principal Investigator: Sylvie Dodin, MD, MSc, Chair for the Integrated Approach in Prevention, Faculty of Medicine, Laval University

People with metabolic syndrome are at increased risk of cardiovascular disease (CVD). Legumes have gained attention in the area of CVD, mainly due to their low-glycemic index and high-fiber contents. Several randomized clinical trials suggest that consumption of legumes may have protective effects on risk of metabolic syndrome and CVD by improving lipid profiles and blood glucose levels. This randomized clinical trial will investigate the short- and long-term effects of incorporating whole legumes (beans, peas, lentils and chickpeas) into women's diets and monitoring changes related to body fatness and dietary habits. Specifically, the researchers will examine the impact of legume consumption on the primary components (waist circumference, blood pressure, fasting plasma triglycerides, HDL-cholesterol and glucose levels) of metabolic syndrome.

" ...consumption of legumes may have protective effects on risk of metabolic syndrome and CVD... "

Take Home Message:

Beans and other legumes have a low-glycemic index. A low-glycemic-index diet may protect against heart disease, diabetes, obesity and cognitive impairments. Gaining an understanding of the long-term effects of legume consumption on metabolic syndrome is invaluable, given the health aspects of low-glycemic index diets are hotly debated in nutrition research.

Effect of pulses and pulse fractions on indices of lipid, carbohydrate and energy metabolism, as well as oxidative status in overweight, hyperlipidemic individuals

Principal Investigator: Peter Jones, PhD, Richardson Centre for Functional Foods and Nutraceuticals

This project is designed to evaluate the safety and efficacy of pea consumption on blood cholesterol levels and other parameters related to diabetes, obesity and cancer, including the effects of legumes on the microbial health of the digestive tract. Researchers will examine the response of health indicators to whole yellow pea and pea fiber fraction consumption over a one month period, compared to a control period where no pulses are provided. The pulse mixture will be provided using bagels, muffins, and snack bars as carriers. It is anticipated that results from this series of studies will improve our fundamental understanding of the ability of pulses to reduce disease risk in overweight individuals with elevated blood lipid levels.

Take Home Message:

The most interesting aspect of this study is the examination of how pea consumption will impact gut health, with particular emphasis on beneficial and non-beneficial bacteria. Increasing the beneficial bacteria in the gut is associated with improved immunity. A health-promoting intestinal environment doesn't favor harmful microbes and includes bowel regularity. In addition, this study may show how simple it is to add pulses to convenient, portable foods (i.e., bagels and muffins), thus appealing to health-conscious consumers who are too busy to prepare meals.

Effectiveness of two levels of pulse consumption on caloric restriction adherence and chronic disease risk

Principal Investigator: Megan A McCrory, PhD, School of Nutrition and Exercise Science, Bastyr University

Excess weight is a significant public health issue, with 66% of Americans currently overweight or obese. The development of life-threatening chronic conditions — heart disease, type 2 diabetes, and some cancers — also is associated with excess weight. Most individuals who intentionally lose greater than 10% of their body weight regain the majority of it; thus, urgency exists to find viable ways to help individuals maintain weight loss.

Foods that are high in fiber, complex carbohydrates and protein and low in caloric density are thought to be an essential part of any weight-loss and weight maintenance diet, not only because they are highly nutritious, but also because they may help regulate appetite. Legumes (dried beans, peas, lentils, and chickpeas) are example of foods with these positive nutritional characteristics, and thus, potentially they may aid in weight loss and help prevent regain. Using a randomized controlled study design, this project will test whether regular legume consumption can assist with weight loss and its subsequent maintenance, as well as promote improvement in chronic disease risks.

Take Home Message:

One of the aims of this study is to identify the amount of legume consumption necessary to help achieve successful weight loss and weight maintenance. Health professionals may encourage individuals trying to lose weight to consume more beans, but more research is needed to determine how much to consume and for how long. This study will provide valuable evidence and direction for consumers.

Pulse crops improve cardiovascular health by modulating adipokine expression

Principal Investigator: Peter Zahradka, PhD, Department of Physiology, University of Manitoba

Based on their fiber content and their low glycemic index, legumes have been linked to cardiovascular health. These crops also contain natural chemicals that have been found to affect the cardiovascular system positively. However, few in-depth studies have been performed to investigate these claims. This study will examine the effect that a daily serving of legumes over eight weeks produces on three specific parameters associated with blood vessel function. Improvements in any of these indices would indicate this high-legume diet may help impede the development of coronary artery disease.

Take Home Message:

While there is evidence to link legume consumption to improved cardiovascular health, many components in legumes still have unknown cardiovascular functions. One of the most interesting aspects of this study will be how legume consumption affects blood vessel function. Gaining an understanding of legumes' impact on blood vessel function may identify ways to combat heart disease before it starts.

Effect of daily pulse consumption on intestinal microbiota, gastrointestinal response and serum lipids in healthy adults

Principal Investigator: Amanda Wright, PhD, Department of Human Health and Nutritional Sciences, University of Guelph

This study will explore how the consumption of various pulses contributes to optimal human health by promoting a healthy intestinal bacterial population and leading to improvements in metabolism which are associated with reduced risks of cancer and cardiovascular disease.

Ample evidence exists that dietary factors can influence the bacterial composition of the gastrointestinal tract (GIT) and that, in turn, the composition of the intestinal microbiota (microflora or bacteria in the gut, both good and bad) can influence human health. Legumes contain prebiotic compounds, including oligosaccharides, fiber and other components, that support a healthy GIT microbiota. This research will explore the influence of daily legume consumption on the human GIT bacterial population and how these changes, in turn, affect the gut environment, enzymatic activity and serum lipids.

Perception of gastrointestinal comfort and bowel habits also will be monitored throughout the study. Researchers seek to confirm anecdotal evidence suggesting that while mild GIT symptoms may be experienced when legumes are introduced into the diet, a quick adaptation occurs and is maintained if regular legume consumption continues.

Take Home Message:

Increasing beneficial bacteria in the gut leads to several favorable outcomes, including stronger immune function, improved cholesterol levels and decreased pathogens in the gut. Plus, ameliorating gastric distress associated with legume consumption could be a key to consumers choosing to add more beans to their diets.

2 *Recently Published Journal Articles on Legumes and Components of Legumes*

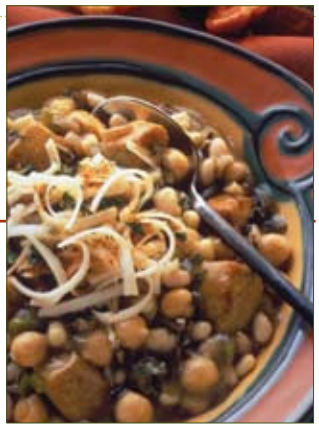
Dietary supplementation with chickpeas for at least five weeks results in small but significant reductions in serum total and low-density lipoprotein cholesterols in adult women and men

Journal: Annals of Nutrition and Metabolism, 2006 50(6):512-8
Authors: Pittaway JK, Ahuja KD Cehun M et al.

Researchers compared the effects of a chickpea-supplemented diet versus a wheat-supplemented diet on human serum lipids and lipoproteins (i.e., cholesterol). Forty-seven free-living adults participated in a randomized crossover weight maintenance dietary intervention involving two dietary periods — chickpea-supplemented and wheat-supplemented diets — each of at least five weeks duration. The serum total-cholesterol and LDL-cholesterol levels were significantly lower, by 3.9% and 4.6%, respectively, after consumption of the chickpea-supplemented diet as compared with the wheat-supplemented diet. Protein and monounsaturated fat intakes were slightly but significantly lower, while carbohydrate intake was significantly higher with the chickpea-supplemented diet as compared with the wheat-supplemented diet. The authors concluded that the inclusion of chickpeas in an intervention diet results in lower serum total- and LDL-cholesterol levels as compared with a wheat-supplemented diet.

Take Home Message:

This study adds further evidence to corroborate previous evidence showing legumes to favorably affect blood cholesterol levels. Additional research should be conducted to consider the long-term impact of consuming chickpeas.



Mediterranean diet, Alzheimer disease, and vascular mediation

Journal: Archives of Neurology, 2006 Dec;63(12):1709-17
Authors: Scarmeas N, Stern Y, Mayeux R et al.

Researchers at Columbia University Medical Center examined the association between the Mediterranean diet and Alzheimer disease. Higher adherence to the Mediterranean diet was associated with lower risk for Alzheimer disease. Compared with subjects in the lowest Mediterranean diet tertile (one-third), subjects in the middle Mediterranean diet tertile had a 53% reduced risk, and those at the highest tertile had a 68% risk reduction for Alzheimer disease. Thus, a greater adherence to the Mediterranean diet is associated with a reduced risk for Alzheimer disease.

Take Home Message:

Foods from plant sources occupy the greatest portion of the Mediterranean diet — potatoes and foods from grains; fruits and vegetables; beans and other legumes; and nuts. This study contributes to evidence that legumes are likely a key food in maintaining cognitive health. The research environment is ripe for more studies examining legumes and cognitive performance, and a long-term study examining effects on Alzheimer disease.

A low-glycemic-index breakfast cereal preferentially prevents children's cognitive performance from declining throughout the morning

Journal: Appetite, 2007 Jul;49(1):240-4
Authors: Ingwersen J, Defeyter MA, Kennedy DO, et al.

UK researchers examined whether the glycemic index of breakfast cereal differentially affects children's attention and memory. Sixty-four children aged 6-11 years were given a high-glycemic index cereal and a low-glycemic index cereal. The children performed a series of computerized tests of attention and memory, once prior to breakfast and three times following breakfast at hourly intervals. The results indicate that children's performance declines throughout the morning and that this decline can be significantly reduced following the intake of a low-glycemic-index cereal as compared with a high-glycemic-index cereal on measures of accuracy of attention and secondary memory.

Take Home Message:

This work is similar to a study by Papanikolaou Y et al. (2006) in which the research showed that consuming 50 grams of a low-glycemic-index carbohydrate meal, relative to a high-glycemic-index carbohydrate meal, generally results in better cognitive performance in adults with type 2 diabetes. Beans and legumes have a low glycemic index, and with the area of mental health growing in importance in the food and health-care industries and with consumers, a study showing the cognitive benefits of bean consumption would garner serious attention.

Efficacy of folic acid supplementation in stroke prevention: a meta-analysis

Journal: Lancet, 2007 June 2;369(9576):1876-82
Authors: Wang X, Qin X, Demirtas H, et al.

A meta-analysis combines and statistically measures the results of several studies on the same topic to provide one overall result. In this meta-analysis, researchers analyzed grouped relevant randomized trials to assess the efficacy of folic acid supplementation in the prevention of stroke. The researchers collected data from 8 randomized trials of folic acid that had stroke reported as one of the endpoints. Folic acid supplementation significantly reduced the risk of stroke by 18%. In addition, a greater beneficial effect (29% reduction) was seen in those trials with a treatment duration of more than 36 months; a decrease in the concentration of homocysteine of more than 20%; and no history of stroke. Overall, this meta-analysis suggests that folic acid supplementation can effectively reduce the risk of stroke.

Take Home Message:

Beans are rich in folate. The findings of this meta-analysis are consistent with work completed by Victor Fulgoni, PhD, (sponsored by Bush Brothers and Company) showing that adults who regularly consume beans have lower blood pressure in comparison to non-bean consumers. Elevated blood pressure is a risk factor for stroke.

Legume intake and reduced colorectal adenoma risk in African-Americans

Journal: Journal of National Black Nurses' Association, 2006 Dec:17(2):6-12.
Authors: Agurs-Collins T, Smoot D, Afful J, et al.

Colorectal adenomas are known precursors for colorectal cancer. Several studies have shown that dietary factors can influence adenoma formation and growth. This study's goal was to examine the relationship between selected dietary factors and the risk for colon polyps. In a case-control design, the dietary histories of 186 African-American men and women (mean age of 58 years) undergoing colonoscopies were assessed. A greater consumption of legumes, such as dried beans, split peas or lentils, was associated with a significant reduction in colorectal cancer (by 81%). Legumes are a good source of dietary fiber and of phytochemical compounds that may play a role in reducing adenoma formation or growth, thereby decreasing the risk of colorectal cancer.

Take Home Message:

This study specifically focuses on how legume consumption, including dry beans, is associated with significant reductions in risk of colorectal cancer among African Americans.

Assessing phytochemical intake in a group of Mexican women

Journal: Salud Publica Mexico, 2007 Apr;49(2):126-131
Authors: Galvan-Portillo MV, Wolff MS, Torres-Sanchez LE, et al.

Researchers in Mexico assessed selected phytochemical intake of 50 women of reproductive age enrolled in a longitudinal cohort study. Values for phytochemical content of Mexican foods were obtained from four different data sets. Selected phytochemicals included flavonol, flavones, secoisolariciresinol, matairesinol (MA), lariciresinol, pinoresinol, cynamic acid (CA) and coumestrol. Daily phytochemical intake ranged from 1.3 microg for MA to 116.3 mg for CA. Pinto beans, oranges, hot sauce, broccoli, apples and onions were the main sources of the selected phytochemical daily intake.

The results of this study contribute to our understanding of the consumption of phtyochemicals in the Mexican diet, and would help evaluate their potential health impact.

Take Home Message:

This study suggests pinto beans are one of the main sources for total phytochemical intake among Mexicans. The results may be of interest to researchers in the U.S. who study Mexican American diets and health. Increased phytochemical consumption has been positively linked to an assortment of chronic diseases, including heart disease and, cancer — the potential protective effects are associated with the antioxidant activity of phytochemicals. Legumes are widely known for their high-fiber and protein attributes, but it's lesser known that they are are also rich in antioxidant phytochemicals. For example, pinto beans are ranked higher than blueberries in antioxidant power.

3 *Research Presented at Experimental Biology, 2007 Washington DC.*

Gastrointestinal discomfort from legumes varies with type and diminishes after four weeks

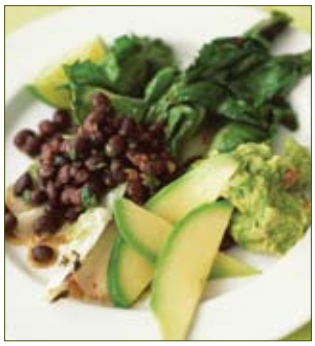
Authors: Winham D, Reeves P, Hutchins A, et al.

Supported by a Beans for Health Alliance research grant, this study examined the effect of consuming ½ cup of pinto beans, black eye peas, vegetarian baked beans or control (carrots) daily on perceptions of flatulence and gastrointestinal symptoms. As part of three eight-week studies that examined the effects of legumes on blood lipids, a questionnaire was administered to 40 men and women to identify perceived changes in flatulence with daily consumption of ½ cup legumes. Participants reported increased flatulence when consuming legumes, with differences among varieties, as compared to the control (carrots), with reports of flatulence diminishing over the study period.

Take Home Message:

Consumers commonly perceive that bean consumption is associated with flatulence. However, this study shows that with regular consumption of legumes, reported flatulence decreases with time.

Associations between body mass index and food groups in the multi-ethnic cohort study



Authors: Howarth NC, Murphy SP, Wilkens LR, et al.

Researchers examined the diets of 191,029 people, consisting of multiple ethnicities, to assess consumption of 15 specific food groups and overweight risk. Intakes of meat, poultry, fish, refined grains, vegetables in mixtures and potatoes were positively associated with risk for overweight. An inverse association was reported for fruits, vegetables, whole grains and legumes. The strongest protective factors for overweight risk were legumes in men and legumes and nuts in women. In fact, a low-meat, high-legume diet was associated with a 2.4 kg/m^2 lower body mass index (BMI) than a high-meat, low-legume diet in all groups, but Latinos. The investigators concluded that diets lower in meats and higher in plant foods such as legumes are associated with a lower risk of overweight.

Take Home Message:

Obesity is growing in the United States and worldwide at alarming rates. While cause and effect cannot be established from this study, it provides more evidence that legume intake protects against obesity.

Baked bean consumption reduces total cholesterol in hypercholesterolemic adults

Authors: Winham D, Hutchins A.

This study funded by the Beans for Health Alliance examined the effect of consuming ½ cup of vegetarian baked beans daily on biomarkers for heart disease and type 2 diabetes among hypercholesterolemic adults. Participants consumed ½ cup daily of either vegetarian baked beans or a placebo for eight consecutive weeks with a 14-day minimum washout and then the treatment was reversed between the control and experimental groups. During the experimental periods, serum total cholesterol decreased by ~6% and LDL-cholesterol by ~5% as compared to the control periods. Thus, the inclusion of vegetarian baked beans as part of the routine diet may help reduce the cholesterol levels and risk of coronary heart disease.

Take Home Message:

This study adds to the growing body of research showing the cholesterol-lowering potential of dry beans.

Black-eye pea consumption reduces glycemic response to a high-glycemic index meal

Authors: Hutchins A, Winham D, Melde C.

In this Bean-for-Health-funded study, scientists examined the glycemic response to three dry bean varieties (pinto beans, black-eyed peas, navy beans), in two amounts each [low-dose (~1/2 cup) and high-dose (~one cup)], as complementary foods in the context of a high-glycemic treatment in non-insulin resistant participants. Black-eyed pea intake (~ ½ cup) as part of a meal reduced the glycemic response to high glycemic index foods even though it did not alter insulin response or indices of perceived satiety at this dosage. Consumption of pinto beans or navy beans in similar amounts (~ ½ cup) did not alter glucose or insulin response. Even though the high-dose black-eyed pea treatment did not alter the glycemic response to high glycemic index foods, it did result in greater perceived satiety post-treatment.

Take Home Message:

This is the first study to show that black-eye pea consumption can lower glycemic response to a high-glycemic index meal. This is relevant for people with diabetes looking to control their blood sugar and insulin.

4 *In The Media*
Source: Nutraingredients-USA.com, December 2006

Glycemic-control is still a rising star, says research

By Jess Haliday

Low-glycemic products are only just gaining momentum, according to Packaged Facts, which predicts that the glycemic-control angle will be an ever more pressing consideration for marketers and formulators in the coming years. Packaged

Facts, a division of *MarketResearch.com*, has published a report entitled *Low Glycemic Index Products in the US* that predicts sales will experience compound annual growth rate (CAGR) of 45.7% through 2011, when they will be worth $1.8 billion.

The report estimates that 2006 sales were in the region of $350 million. The CAGR from 2003 to 2005 was 55.4%, and the continuing growth indicates that it has a long way to go before the trend starts to run out of steam.

One of the drivers behind the trend is undoubtedly Americans' shift towards healthier eating patterns. Awareness of the connection between diet and diabetes is also a factor: according to the American Diabetes Association, 20.8 million children and adults in the United States — seven percent of the population — have diabetes (types I and II). Of these, as many as 6.2 million are thought to be unaware that they have the disease.

Another is the availability of products in mainstream stores. "Low glycemic foods and beverages have made it out of their corners in health food stores to become a widely accepted addition to supermarkets, mass merchandisers and drug stores where they are often double marketed with like foods as well as in the diabetic supplies aisle," said Don Montuori, publisher of Packaged Facts. "This exposure, positive press, and a wealth of new product offerings have helped create a remarkable growth market much akin to what low-carb was."

Glycemic index is perhaps the most consumer-friendly measure of carbohydrates' effect on blood sugar levels. It ranks individual foods according to their impact on blood sugar levels. But some believe that the index is too basic a measure and advocate that glycemic load may be more helpful, since it also considers the amount eaten and the foods' context as part of the overall diet, thereby quantifying the potential glycemic impact of foods. The glycemic load is calculated by multiplying the glycemic index by the grams of carbohydrates in a serving.

The complex nature of carbohydrates' effect is further underscored by the definitions drawn up by the American Association of Cereal Chemists (AACC) Glycemic (Net) Carbohydrate Definition Committee and announced in September. While the committee intended to find just one definition to help food manufacturers communicate how the carbohydrate content of a product will affect blood glucose levels, the upshot of heated discussions amongst its members was four:

1. Available carbohydrate is "carbohydrate that is released from a food in digestion and which is absorbed as monosaccharides and metabolized by the body."
2. Glycemic response is defined as "the change in blood glucose concentration induced by ingested food."
3. Glycemic carbohydrate is "carbohydrate in a food which elicits a measurable glycemic response after ingestion."
4. Glycemic impact is "the weight of glucose that would induce a glycemic response equivalent to that induced by a given amount of food."

Moreover Danisco's Stuart Craig, who is also AACC's international president, said that it is likely the definition will not be the end point, but that the matter will continue to be debated in the future.

Take Home Message:

Researchers continue to debate the complexities of carbohydrates, but as more consumers recognize the value of low-glycemic foods in relation to health and weight management, the market place for such foods is expanding.

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

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