

The Health Benefits of Pulses

Clinical Trial Findings

DRY BEANS, PEAS,
LENTILS, CHICKPEAS

From 2006 to 2008, the Canadian pulse industry supported seven human clinical trials to look at the connection between eating pulses and the prevention of chronic diseases. The studies, funded with support from Agriculture and Agri-Food Canada, revealed a number of positive health benefits in relation to eating pulses and the management of diabetes, heart disease and obesity.

Health benefits of pulses identified in clinical trials:

Pulses & Cardiovascular Health

- Reduce total and LDL cholesterol levels (in some studies)
- Help restore blood flow in patients with fatty plaques in their arteries
- Reduce blood pressure (in some studies)

Pulses & Weight Management

- Decrease appetite
- Decrease in body weight or body mass index (in some studies)
- Decrease waist circumference or abdominal obesity

Pulses & Diabetes

- Decrease spikes in blood sugar and insulin levels after eating
- Improve insulin resistance

Pulses & Gut Health

- Serve as prebiotic material
- Increase levels of healthy gut bacteria
- Lower levels of putrefactive and pathogenic gut bacteria

1 Exploring the health benefits associated with daily pulse consumption in individuals with peripheral arterial disease

Principal Investigator: **Peter Zahradka**, PhD, Canadian Centre for Agri-Food Research in Health and Medicine, University of Manitoba

Co-Investigators: **Carla Taylor**, PhD, Department of Human Nutritional Sciences, University of Manitoba
Randy Guzman, MD, Department of Surgery, St. Boniface General Hospital, University of Manitoba

Researchers from the University of Manitoba found that daily pulse consumption leads to major improvements in blood vessel function in participants with peripheral arterial disease (PAD), a condition in which blood flow (perfusion) to the limbs is reduced. Patients with PAD have hardened and narrowed arteries due to atherosclerotic plaque buildup in the blood vessels of the legs. They experience pain, cramping or numbness when walking. Pulse consumption (½ cup mixed pulses/day for 8 weeks) resulted in significant improvements in arterial function (increased limb perfusion and decreased arterial stiffness). There were no changes in fat hormones or blood pressure. Regular pulse consumption also significantly reduced circulating total and LDL cholesterol levels and the body mass index of study participants (n=26). Study findings also showed that regular pulse consumption increased the intake of dietary fibre, folate, Vitamin C, iron, zinc, potassium and protein over pre-study consumption levels.

2 Pulse consumption and the regulation of food intake, blood glucose and cholesterol levels

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

Co-Investigators: **France Cho**, PhD, **Anthony Hanley**, PhD, **Rebecca Mollard**, PhD and **Bohdan Luhovy**, PhD, Department of Nutritional Sciences, University of Toronto

Dr. Anderson's research demonstrates that eating pulses helps reduce hunger and improves blood sugar (glucose) control when consumed alone or as part of a meal, and that the effects of pulse consumption extend beyond one meal. Normal weight individuals (n=15) eating pulses had lower blood sugar and hunger levels following a later meal. Dr. Anderson also demonstrated that regular consumption of pulses (5 cups per week for 8 weeks) without further dietary advice improved long-term blood sugar control, reduced the amount of food and calories eaten and decreased the waist line and blood pressure of overweight and obese individuals (n=40). Reductions were similar to those seen on an energy-restricted diet achieved through dietary counseling. However, the pulse diet did not have any effect on levels of lipids or markers of inflammation in the blood. The researchers conclude that regular consumption of pulses could lead to reduced risk of diseases associated with excess body weight.

3 The effects of whole and fractionated yellow peas on indices of cardiovascular disease, diabetes and gut health

Principal Investigators: **Peter Jones**, PhD, Richardson Centre for Functional Foods and Nutraceuticals, University of Manitoba
Denis Krause, PhD, Department of Animal Science, University of Manitoba

Co-Investigators: **Linda Malcolmson**, PhD, Canadian International Grains Institute
Trust Beta, PhD, Department of Food Science, University of Manitoba
Curtis Rempel, PhD, MBA, Richardson Centre for Functional Foods and Nutraceuticals

Researchers at the Richardson Centre for Functional Foods and Nutraceuticals at the University of Manitoba found that the dietary fibre-rich content of peas helped to regulate insulin management in overweight adults with elevated cholesterol levels (n=23). Participants consuming muffins made with whole pea flour or pea fibre (equivalent to fibre in ½ cup dry yellow peas for 4 weeks) had fasting insulin levels 16% lower than participants consuming control muffins made with wheat flour. They also found that consuming pea fibre significantly decreases insulin resistance by up to 20% compared to control. Insulin resistance, a condition where the body no longer properly uses the insulin it produces, increases

Pulses contain many heart-healthy nutrients. Pulses are rich in dietary fibre and folate and contain little fat and no saturated fat or cholesterol.

The 2005 Dietary Guidelines for Americans, developed by the USDA, recommend eating three cups of dry beans a week. The USDA defines dry beans to include beans, peas, chickpeas and lentils¹.

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the risk of elevated blood glucose levels and the development of diabetes. Consuming whole pea flour was also shown to result in a shift in the android to gynoid fat ratio, suggesting that pulses help reduce obesity in the abdominal area. However, consuming ½ cup of pulses in the form of flour, in an energetically-controlled environment, does not improve some chronic disease risk factors, including total cholesterol, LDL cholesterol and triglyceride levels, post-prandial glucose responses or percent total fat mass.

Dr. Jones also collaborated with Dr. Denis Krause of the University of Manitoba to investigate the effects of these dietary treatments on gut microbial health. They found that eating pea hulls fibre or whole peas regularly results in an increase in *Lactobacillus* and *Bifidobacteria* bacterial species, both of which are considered important in gut health.

4 Impact of pulse consumption on intestinal microbiota, serum lipids and gastrointestinal response

Principal Investigators: **Amanda Wright**, PhD and **Alison Duncan**, PhD, RD, Department of Human Health and Nutritional Sciences, University of Guelph

Co-Investigators: **Edward Farnworth**, PhD, **Joyce Boye**, PhD and **Susan Tosh**, PhD, Food Research and Development Centre, Agriculture and Agri-food Canada

Researchers from the University of Guelph and AAFC in Saint Hyacinthe and Guelph found that regular pulse consumption (½ cup per day for 4 weeks) is well tolerated and may improve gut health in healthy males with a mean age of 28.1 years (n=21). This research shows promising effects on gastrointestinal bacterial populations that have been linked in other studies with improved health. The observed changes in intestinal bacterial population and metabolic activity suggest that pulses have prebiotic activity in humans. Results of the biomarkers of heart disease risk did not indicate any significant effects of the pulse treatments, possibly because the subjects were healthy young individuals at low risk of heart disease. Results of the gastrointestinal response indicated a minor, but statistically significant, increase in flatulence severity with consumption of chickpeas and lentils. Incidence of flatulence, abdominal discomfort, bowel function and overall gastrointestinal function were not significantly affected by pulse consumption.

5 Pulse consumption, weight loss success and chronic disease risk

Principal Investigator: **Megan McCrory**, PhD, Departments of Foods and Nutrition and Psychological Sciences, Purdue University

Co-Investigators: **Jennifer Lovejoy**, PhD, **Erica Oberg**, ND and **Petra Eichelsdoerfer**, MS, ND, School of Nutrition and Exercise Science, Bastyr University

Researchers at Bastyr University in Washington and Purdue University in Indiana conducted a study with overweight or obese individuals (n=43) to find out if consuming pulses while intentionally restricting caloric intake can increase weight loss, potentially reducing the risk for chronic diseases such as heart disease and diabetes. They found that consuming ½ cup a day of pulses improves initial weight loss success. Participants consuming larger servings of pulses daily (~2 cups/day for 6 weeks) had a smaller waist size and lower diastolic blood pressure by the end of the study. These participants had improved fasting insulin levels

compared to those consuming less or no pulses. In addition, consuming more than ½ cup a day of pulses offers further benefits on insulin resistance. Improvements in total, HDL and LDL cholesterol levels and a circulating marker for inflammation (CRP) and total weight loss were observed in all groups, thus no significant difference was observed. The researchers conclude that consuming at least three cups of pulses a week as recommended by the USDA improves weight loss success and helps to reduce chronic disease risk.

6 Prebiotic effects of chickpeas

Principal Investigator: **Wendy Dahl**, PhD, Food Science and Human Nutrition Department, University of Florida

Co-Investigators: **Ursula Fernando**, PhD, **Janet Hill**, PhD, **Andrew Van Kessel**, PhD and **Robert Tyler**, PhD, College of Agriculture and Bioresources, University of Saskatchewan
Gordon Zello, PhD, College of Pharmacy and Nutrition, University of Saskatchewan

Researchers from the University of Saskatchewan and the University of Florida found that eating canned chickpeas daily beneficially modulates gut bacteria of subjects in healthy individuals (n=12 with a mean age of 25.6 years). Individuals consuming chickpeas (200 grams/day for 3 weeks) had reduced levels of harmful bacteria (putrefactive and pathogenic bacteria), whereas individuals consuming raffinose (5 grams), a common oligosaccharide in pulses, every day had elevated levels of putatively beneficial gut bacteria. Study participants consuming the chickpea diet reported a small but significant increase in flatulence, however bloating, bowel movement frequency and abdominal pain were not significantly affected by pulse consumption. The researchers conclude that avoidance of pulses due to potential gastrointestinal side effects appears to be unfounded.

7 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, Faculty of Medicine, Laval University

Co-Investigators: **Simone Lemieux**, PhD, Nutraceuticals and Functional Foods Institute, Laval University
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Jean-Claude Forest, MD, PhD and **André Lemay**, MD, PhD, St-François d'Assise Hospital Research Centre, CHUQ

Researchers from Laval University investigated how eating 3 cups of pulses weekly for 16 weeks affected components of metabolic syndrome, percentage of body fat and food habits in women (n=134). Metabolic syndrome is a clustering of metabolic risks factors for cardiovascular disease and type 2 diabetes, including obesity, high blood pressure, insulin resistance, elevated fasting glucose levels, elevated lipids and low HDL, the “healthy” cholesterol. The pulse diet provided higher levels of energy, carbohydrates and soluble, insoluble and total fibre as compared to the control diet containing no pulses. The researchers found that weekly incorporation of 3 cups of pulses in the diet produced a favourable effect on anthropometric variables, but the magnitude of the change achieved during the study period was too modest to modify metabolic risk factors.

Obesity has reached epidemic levels worldwide. More than one billion adults are overweight, at least 300 million of them being clinically obese.²

Pulses have a low glycemic index. Most of the carbohydrates in pulses are fibre and starch that prevent blood sugars from rising quickly after a meal or snack.

References

- ¹ U.S. Department of Health and Human Services. Dietary Guidelines for Americans. 2005. www.health.gov/DietaryGuidelines/dga2005/document/default.htm.
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