Managing Diabetes with Plant Based Eating

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Objectives

- Gain a deeper understanding of the health benefits of micronutrients from Whole Food Plant - Based eating (WFPBE).
- Name 2 nutrients in plant foods that influence health in diabetes
- State 3 benefits of enjoying WFPBE
“Genes load the gun but lifestyle pulls the trigger.”

Elliott Joslin, MD

- Healthy Eating
- Pharmacotherapy
- Physical activity

- Fat, sugar & protein concern
- Oxidative stress and Inflammation increase the need for dietary antioxidants
Medical Complications of Hyperglycemia

- Cardiovascular disorders
- Retinopathy, nephropathy, neuropathy
- Infections, cataracts, connective tissue disorders
- Higher risk for cognitive impairment
“To eat is a necessity, but to eat intelligently is an art”  
La Rochefoucauld, Maxims, 1665
Whole Plant Foods

A healthy trend that is here to stay

Fiber, resistant starch = healthy micro biome

Phytochemicals, antioxidants, flavonoids

Nutrient - dense

Contain all 6 tastes...salty, sweet, sour, pungent, astringent, bitter

No cholesterol, low fat except avocado, nuts and coconut
Dr. Neal Barnard’s program for reversing Diabetes

- At Pennington Biomedical Research center in Baton Rouge, researchers saw after just 3 days on a high-fat diet, significant increase in intramyocellular lipids. Evidence shows that diet changes (plant foods) can reduce the intramyocellular lipids.

- Diabetes is not just a sugar problem; it is also a fat problem.

Barnard, Neal D, MD. Dr. Neal Barnard's program for reversing Diabetes. The scientifically proven system for reversing Diabetes without drugs. 2007.
Dietary fat acutely increases glucose concentration and insulin requirements in patients with type 1 diabetes. Researchers provided 48 hours’ worth of meals with identical carbohydrate and protein content but varying fat content (10 grams vs 60 grams). The high-fat meals required an average of 42% more insulin in order to bring blood sugar under control. When individuals with type 1 diabetes follow a low-fat, PBD, their blood glucose variability goes down, allowing their blood glucose levels to become more predictable.

“Post Prandial dysmetabolism induces immediate oxidant stress, which correlates with increased glucose and triglycerides after a high-fat meal.”

“Transient increase in free radicals triggers atherogenic changes including inflammation, endothelial dysfunction, hypercoagulability, and sympathetic hyperactivity.”

“Markers of inflammation and CV health improve with improvement in PP glucose and lipids.”

O'Keefe, James H, MD, from the Mid America Heart Institute and University of Missouri–Kansas City, and colleagues. Improve Postprandial Glucose with "Anti-Inflammatory Diet" Markers of inflammation and cardiovascular health show improvement with the improvement of postprandial glucose and lipid profiles. J Am College of Cardiology, 2008;51:249-255.
Anti-inflammatory Diet

Improve PP glucose, TG, and inflammation:

- Select minimally processed, high-fiber CHOs with low glycemic index, vegetables, fruits, whole grains, legumes, seeds and nuts

- A fatty meal leads to immediate increases in serum TG levels. Reducing TG levels can reduce the risk for coronary artery disease by as much as 40%.”

O'Keefe, James H, MD, from the Mid America Heart Institute and University of Missouri–Kansas City, and colleagues. Improve Postprandial Glucose with "Anti-Inflammatory Diet” Markers of inflammation and cardiovascular health show improvement with the improvement of postprandial glucose and lipid profiles. J Am College of Cardiology, 2008;51:249-255.
Higher intake of animal protein was associated with an increased risk of T2D, while higher intake of vegetable protein was associated with a modestly reduced risk.
Both high and low percentages of CHO diets were associated with increased mortality, with minimal risk observed at 50–55% CHO intake. Low CHO dietary patterns favoring animal-derived protein and fat sources were associated with higher mortality, whereas those that favored plant-derived protein and fat intake were associated with lower mortality, suggesting that the source of food notably modifies the association between carbohydrate intake and mortality.
There is an increase in postprandial incretin and insulin secretion after consumption of a Vegan meal, suggesting a therapeutic potential of plant-based meals for improving beta-cell function in T2D.

A Plant-Based Meal Stimulates Incretin and Insulin Secretion More Than an Energy- and Macronutrient-Matched Standard Meal in Type 2 Diabetes: A Randomized Crossover Study; Hana Kahleova 1,2,*, Andrea Tura 3, Marta Klementova 1; Lenka Thieme 1; Martin Haluzik 1; Renata Pavlovcova 1; Martin Hill 4; and Terezie Pelikanova 1

Institute for Clinical and Experimental Medicine, 14021 Prague, Czech Republic; 2 Physicians Committee for Responsible Medicine, Washington, 5100 Wisconsin Ave, NW, Suite 400, Washington, DC 20016, USA; 3 Metabolic Unit, CNR Institute of Neuroscience, 35127 Padua, Italy; 4 Institute of Endocrinology, 11394 Prague, Czech Republic Published: 26 February 2019; Nutrients 2019, 11(3), 486; doi:10.3390/nu11030486
A vegetarian diet-induced increase in linoleic acid in serum phospholipids is associated with improved insulin sensitivity in subjects with type 2 diabetes

The insulin-sensitizing effect of a vegetarian diet might be related to the increased proportion of LA in serum phospholipids.
Diet composition and the energy content, rather than the carbohydrate count, should be important considerations for dietary management and this study demonstrates that processed meat consumption is accompanied by impaired GIH responses and increased oxidative stress marker levels in diabetic patients.

A Plant-Based Meal Increases Gastrointestinal Hormones and Satiety More Than an Energy- and Macronutrient-Matched Processed-Meat Meal in T2D, Obese, and Healthy Men: A Three-Group Randomized Crossover Study

*Nutrients* 2019, 11(1), 157; [https://doi.org/10.3390/nu11010157](https://doi.org/10.3390/nu11010157); Marta Klementova 1; Lenka Thieme 1; Martin Haluzik 1; Renata Pavlovicova 1; Martin Hill 2; Terezie Pelikanova 1 and Hana Kahleova 1,3,* Institute for Clinical and Experimental Medicine, 140 21 Prague, Czech Republic; Institute of Endocrinology, 113 94 Prague, Czech Republic; Physicians Committee for Responsible Medicine, Washington, DC 20016, USA
Whole food Plant based Diet

• A randomized controlled trial using a WFPB diet in the community for obesity, ischemic heart disease or diabetes led to significant improvements in BMI, cholesterol and other risk factors.

• The authors state this research has achieved greater weight loss at 6 and 12 months than any other trial that does not limit energy intake or mandate regular exercise.

* * *

Nutrition & Diabetes (2017) 7, e256; doi:10.1038/nutd 2017.3; Published online 20 March 2017; The BROAD study: A randomized controlled trial using a whole food plant-based diet in the community for obesity, ischaemic heart disease or diabetes; N Wright¹, L Wilson², M Smith³, B Duncan⁴ and P McHugh⁵
• Dietary intervention using a PBD can improve beta-cell function and insulin resistance.

• This was demonstrated by researchers who altered the macronutrient composition (~75% of energy from carbohydrates, 15% protein, and 10% fat), with no limit on energy intake.

• The group that consumed a low-fat vegan diet showed marked improvements in glucose sensitivity, fasting insulin sensitivity, and a decrease in fasting plasma glucose.

• Both a low-fat vegan diet and a diet based on ADA guidelines improved glycemic and lipid control in type 2 diabetes patients.

• These improvements were greater with a low-fat vegan diet.

Consumption of a high-fiber diet (~50g/d) reduces glycemia, hyperinsulinemia and lipemia in subjects with type 2 diabetes and glycemia in type 1 diabetes.

Resistant starch may modify postprandial glycemia, prevent hypoglycemia and reduce hyperglycemia. Eg. Under-ripe bananas, legumes, whole grains, cooked-then-cooled starchy foods such as rice, potatoes or pasta, tapioca and some corn varieties.

Resistant Starch (RS)

- RS is like a carbohydrate on a molecular level, but is digested like a fiber.
- Delayed digestion helps reduce postprandial blood glucose spikes
- RS increases uptake of important minerals, such as calcium.
- Makes the colon less likely to harbor unhealthy bacteria and more likely to hold onto healthy bacteria by creating a more acidic environment.
- RS blocks the absorption of toxins
Viscous fiber supplements improve conventional markers of glycemic control beyond usual care and should be considered in the management of type 2 diabetes.

Asparagus, Brussels sprouts, sweet potatoes, turnips, apricots, mangoes, oranges, legumes, barley and oat bran (whole grain oats)
"After a systematic review of the available evidence, prebiotics and substances with prebiotic properties can have beneficial effects on metabolic and inflammatory biomarkers in individuals with type 2 diabetes mellitus," said Dr. Melissa Brown of the University of Saint Joseph, in West Hartford, Connecticut.

Future research should include studies of longer duration, and studies that include both males and females, according to Dr. Brown. [https://bit.ly/2VIqJ5v](https://bit.ly/2VIqJ5v); J Acad Nutr Diet 2019.
Prebiotics are non-digestible foods such as fiber (whole plant foods) that promote the growth of beneficial bacteria in the gut.

Beneficial bacteria…
- Increase the absorption of minerals such as Ca, Mg and iron
- Provide immune support
- Produce short chain fatty acids such as butyrate which is the preferred energy source for the cells in the large intestine, among many other benefits.
Prebiotic properties of Almonds

Some of the fat in the almonds travels along with the fiber to the lower intestine where it has potential prebiotic effects to promote the growth of beneficial bacteria such as bifidobacteria and Eubacterium rectale.

Soybeans and Chickpeas
Bioactive compounds

This review discusses the current evidence surrounding the proposed mechanisms of action for soybeans and certain pulses, and their bioactive compounds, to effectively reduce insulin resistance.

Soybeans are the best-known source of isoflavones, including the major isoflavone aglycones, genistein, daidzein and glycine, and their respective glycoside conjugates, genistin, daidzin, and glycitin. Chickpeas also contain genistein and daidzein; however, the major isoflavones found in chickpeas are biochanin A (aglycone and glucoside forms) and formonentint.

Nutrients 2018, 10(4), 434; doi:10.3390/nu10040434; Rebelling against the (Insulin) Resistance: A Review of the Proposed Insulin-Sensitizing Actions of Soybeans, Chickpeas, and Their Bioactive Compounds; Jaime L. Clark 1,2, Carla G. Taylor 1,2,3 and Peter Zahradka 1,2,3,* Canadian Centre for Agri-Food Research in Health and Medicine, St. Boniface Hospital Albrechtsen Research Centre, Winnipeg, MB R2H 2A6, Canada; Department of Food and Human Nutritional Sciences, University of Manitoba, Winnipeg, MB R3T 2N2, Canada; Department of Physiology and Pathophysiology, University of Manitoba, Winnipeg, MB R3E 0T5, Canada; Published: 30 March 2018
Soybeans & chickpeas

The proposed mechanisms of action for insulin-sensitizing actions of soybeans, chickpeas, and their bioactive compounds include…

- Increasing glucose transporter-4 levels
- Inhibiting adipogenesis by down-regulating peroxisome proliferator-activated receptor-γ
- Reducing adiposity, positively affecting adipokines, and
- Increasing short-chain fatty acid-producing bacteria in the gut.
Sprouting unlocks Nutrients

• Complex molecules become simpler and easier to digest
• Vitamin C, folate, soluble fiber and antioxidants increase
• Insoluble fiber decreases

... and more!
“Whole Grain Oats Improve Insulin Sensitivity, Cholesterol profile and Modify Gut Microbiota Composition in C57BL/6J Mice.”

The aim was to compare the physiologic effects of whole grain oats flour with low bran oats flour. β-Glucan, a soluble fiber found in oats has been shown to reduce glycemia and cholesterolemia and alleviate insulin resistance and metabolic syndrome.
If you get the inside right, the outside will fall into place. Eckhart Tolle

All disease begins in the gut. Hippocrates 460 BC
Comment on our modern diet...

“Antibiotics, disinfectants, and low use of plant foods may have forever altered our ancient gut microbiome...Dietary modulation to manipulate specific gut microbial species may offer therapeutic approaches.”

Western Diet and Microbiome

- Scientists are pushing to restore human health in Western countries by changing our diet to restore the microbial species lost over the evolution of Western diet.

- Researchers at the University of Alberta advocate for increasing dietary fiber intake as one path forward in regaining microbial biodiversity.
Microbiome & Diabetes

- Microbiome and genetics play a major role in the process of development of Type 1 diabetes.
- Foods with prebiotic properties can change the gut flora and possibly reduce the probability of developing T2DM.

The Gut Microbiome and Diabetes; 2018: Volume 38: Number 6; On The Cutting edge; A peer Reviewed publication of DCE DPG of the Academy of Nutrition and Dietetics.
Gut Microbiome & its Metabolites Protect against...

- Type 2 diabetes, Obesity, Autism
- Metabolic syndrome
- Neuropsychiatric disorders
- Most, if not all, Autoimmune diseases, including MS, RA and IBS
Gut Microbes

- Influence serotonin levels
- Detoxify drugs and other environmental metabolites
- Synthesize essential vitamins, such as biotin, folate and vitamin K
- Exert anti-inflammatory activity
Gut Microbes

- Digest dietary fiber to produce protective metabolites, butyrate, SCFAs for the colon
- Influence the development and maintenance of the immune system
- Compete with pathogenic microbes and create an unlivable environment for pathogens and maintain the integrity of the intestinal epithelial barrier

Short-chain fatty acids (SCFAs…acetic acid, butyric acid) are produced by gut microbes via carbohydrate fermentation, and **deficiency in SCFA production is associated with type 2 diabetes.**

SCFAs help to nourish the cells that line the gut, reduce inflammation, and regulate hunger.

Through consumption of a high-fiber diet, **SCFAs can create a more acidic pH in the gut and reduce the number of unwanted bacterial species, leading to an increase in insulin production and improved glucose regulation.**

Gut bacteria selectively promoted by dietary fibers alleviate type 2 diabetes

The high-fiber diet (50g) induced changes in the entire gut microbe community & correlated with

- A decline in HbA1C levels
- Improved blood-glucose regulation
- Elevated levels of glucagon-like peptide-1
- Produced SCFAs modulate appetite and inflammation. Deficiency of gut SCFAs is associated with type 2 diabetes.

Microbial modulation of diabetes; Science 09 Mar 2018: Vol. 359, Issue 6380, pp. 1151-1156 DOI: 10.1126/science.aao5774;
Plants provide “phytochemicals” — and a spectrum of secondary metabolites and colorful pigments that promote health. 10,000+ phytochemicals in our food supply!
Phytochemicals are plant nutrients with specific biological activities that support human health.

Some of the important bioactive phytochemicals include polyphenols, terpenoids, resveratrol, flavonoids, isoflavonoids, carotenoids, limonoids, glucosinolates, phytoestrogens, phytosterols, anthocyanins, ω-3 fatty acids, and probiotics.

They play specific pharmacological effects in human health such as anti-microbial, anti-oxidants, anti-inflammatory, diabetes, hypolipidemic, immunomodulator, antiallergic, anti-spasmodic, anti-cancer, anti-aging, hepatoprotective, neuroprotective, hypotensive, osteoporosis, CNS stimulant, analgesic, protection from UVB-induced carcinogenesis, and carminative.

Phytochemicals block the activation of pro-inflammatory genes

Inflammation and You: How Foods From Plants Protect Us From Disease. Daniel H Hwang, Agricultural Research/April 2009, 6-7

Dietary intake of flavonoid-rich foods reduce inflammation-mediated chronic diseases

Results suggest a strong correlation between higher phytonutrient intake and improved body composition. Overall diet quality seems to make the most difference, but phytonutrients are likely a key reason for those benefits.

Phytochemicals

Antioxidants

Flavonoids
Daily dose of Antioxidants?

- In the process of breaking down and metabolizing foods, our bodies generate free radicals. “We’re learning that antioxidants should be consumed with every meal,” says Prior. Our bodies can’t store antioxidants.


- "High intake of fruit and vegetables is related to low oxidative stress and inflammation in patients with type 2 diabetes,” Fruit and vegetable intake may reduce oxidative stress and inflammation in Type 2 Diabetics.

Antioxidants and risk of type 2 diabetes

- Higher levels of total dietary antioxidants were associated with a lower risk of type 2 diabetes in middle-aged women.

- Evidence suggests that oxidative stress may contribute to the pathogenesis of type 2 diabetes.

Vitamin C and Metabolic Syndrome:

- Metabolic Syndrome increases inflammation and oxidative stress in the body.

- New research indicates that these factors increase vitamin C needs and adequate dietary vitamin C is likely important in the treatment of metabolic syndrome.

January, 07, 2019; Consumer Related Article: Metabolic syndrome patients need more vitamin C to break cycle of antioxidant depletion, Research Related Article: Redox Biology. 26 December 2018.
Flavonoids, 9000 phenolic compounds, are products of secondary metabolism of plants.

Flavonoids have shown protective effects against cancer, cardiovascular diseases, GI alterations and nervous system-related syndromes, such as depression, epilepsy, Alzheimer’s disease and neurodegenerative disease, among other pathologic conditions.
Dietary Flavonoids

- Grapefruit, lemon, orange, capers, apples, cranberries, arugula, asparagus, broccoli, cabbage, endive, fennel, mustard greens, okra, onions, peppers, radish (raw, seeds, leaves), beans, buckwheat

- Oregano, celery, celery seed, parsley, thyme, peppers, saffron, chives, coriander, ginger,
Dietary Flavonoids T2DM

Review discusses our current understanding of the pathophysiology of T2DM and highlights the potential anti-diabetic effects of flavonoids (over 9000 identified) and the mechanisms of their actions.

Flavonoids, polyphenolic compounds abundant in some fruits, vegetables, and medicinal herbs, exert many beneficial effects in various chronic diseases including diabetes.

*Nutrients* 2018, 10(4), 438; doi:10.3390/nu10040438; Review; Dietary Flavonoids in the Prevention of T2D: An Overview; Hana Alkhalidy, Yao Wang and Dongmin Liu. Department of Human Nutrition, Foods and Exercise, College of Agricultural and Life Sciences, Virginia Tech, Blacksburg, VA 24060, USA; Department of Nutrition and Food Technology, Faculty of Agriculture, Jordan University of Science and Technology, Irbid 22110, Jordan; Published: 31 March 2018; Abstract
T2D is a result of chronic IR and loss of β-cell mass and function

One of the suggested triggers causing β-cell dysfunction and IR that ultimately lead to T2D is excessive ROS production

Flavonoids can protect and restore antioxidant defense enzymes such as superoxide dismutase, catalase, and glutathione peroxidase, and inhibit ROS-producing enzymes such as xanthine oxidase

Nutrients 2018, 10(4), 438; doi:10.3390/nu10040438; Review; Dietary Flavonoids in the Prevention of T2D: An Overview; Hana Alkhalidy 1,2, Yao Wang 1 and Dongmin Liu 1,* Department of Human Nutrition, Foods and Exercise, College of Agricultural and Life Sciences, Virginia Tech, Blacksburg, VA 24060, USA; Department of Nutrition and Food Technology, Faculty of Agriculture, Jordan University of Science and Technology, Irbid 22110, Jordan; Published: 31 March 2018; Abstract
Flavonoid intake and all-cause mortality

High consumption of flavonoids is associated with reduced risk of mortality in older women. The benefits of flavonoids may extend to the etiology of cancer and cardiovascular disease.
Spices in the management of diabetes mellitus

- Spices are rich in antioxidants, have anti-inflammatory, bioactive and anti-diabetic properties that can help manage DM.
- Commonly used spices such as cinnamon, ginger, turmeric and cumin, and their use for prevention and management of diabetes and associated complications were studied.

*Food Chemistry, Vol 217, 15 Feb 2017, Pg 281-293; Xinyan Bi et al.*, Joseph Lim et al., Christiani Jeyakumar Henry et al.
Ceylon Cinnamon (C. verum)

- Intake of 2g of cinnamon for 12 weeks significantly reduces the HbA1c, SBP and DBP among poorly controlled type 2 diabetes patients.

- Cinnamon supplementation could be considered as an additional dietary supplement option to regulate blood glucose and blood pressure levels along with conventional medications to treat type 2 diabetes mellitus.

Cinnamon, diabetes, cognition

- People with diabetes or pre-diabetes have a higher risk for cognitive impairment.

- Evidence indicates that consumption of culinary herbs and spices such as cinnamon, turmeric, and ginger may improve working memory.

Curcumin has shown the confident results to be effective for the treatment of impaired glucose tolerance. Fenugreek and flaxseed may also be effective.

These results suggest that in vivo the hypoglycaemic effect of Fenugreek Seed Extract is mediated, at least in part, by the activation of an insulin signalling pathway in adipocytes and liver cells.

*Br J Pharmacol.* 2005 Sep;146(1):41-8. The hypoglycaemic activity of fenugreek seed extract is mediated through the stimulation of an insulin signalling pathway. Vijayakumar MV1, Singh S, Chhipa RR, Bhat MK.
Diabetes & kidneys

Our study showed a strong negative association between vegetarian diets and prevalence of CKD. If such associations are causal, vegetarian diets could be helpful in reducing the occurrence of CKD.

Nutrients 2019, 11(2), 279; doi:10.3390/nu11020279 Association of Vegetarian Diet with Chronic Kidney Disease; Hao-Wen Liu; Wen-Hsin Tsai; Jia-Sin Liu; and Ko-Lin Kuo3,4,*
We propose that plant-based diets should be included as part of the clinical recommendations for both the prevention and management of CKD.

Plant based dietary pattern is associated with a reduced risk of all-cause mortality in CKD patients.

Vegetarian Diets and Chronic Kidney Disease: Philippe Chauveau; Laetitia Koppe; Christian Combe; Catherine Lasseur; Stanislas Trolonge; Michel Aparicio; Nephrol Dial Transplant. 2019;34(2):199-207.
Acid levels in the diet could have profound effects on kidney health

A diet rich in wheat flour and animal protein produces an acidic environment in the body that worsens with age as kidney function declines. This acid load can be detrimental to a variety of tissues and processes. Research suggests that consuming more fruits and vegetables—which are highly alkaline—may help counteract these effects.

American Society of Nephrology  Atlanta, GA (November 9, 2013
The studies were organized into three categories (vegetarian, DASH diet, and fiber supplement), two evaluated supplements and five dietary patterns. Vegetarian diet reduced albuminuria in three trials, two in patients with type 1 DM and one in patients with type 2 DM; and one study demonstrated a change in the eGFR in type 1 DM. The individual quality of the studies was low/uncertain. A vegetarian dietary pattern may have a beneficial effect on these renal outcomes.
Carotenoids & Cataracts

Prospective observational data from a large (39,876) cohort of female health professionals, higher dietary intakes of lutein, zeaxanthin and vitamins C, E from food were associated with significantly decreased risks of cataract. Eg. Yellow, orange and red pigments in plant foods

Lutein, zeaxanthin and Cognitive Function

Among the carotenoids, lutein and zeaxanthin are the only two that cross the blood-retina barrier to form macular pigment in the eye. They also preferentially accumulate in the human brain.

Widely available in yellow, orange and green vegetables...spinach is one of the best sources.

The effects of lutein on cardiometabolic health

Higher dietary intake and higher blood concentrations of lutein are associated with better cardiometabolic health.

The effects of lutein on cardiometabolic health across the life course: a systematic review and meta-analysis1,2 Elisabeth TM Leermakers3,* Sirwan KL Darweesh3, Cristina P Baena6, Eduardo M Moreira3, Debora Melo van Lent3, Myrte J Tielemans3, Taulant Muka3, Anna Vitezova3, Rajiv Chowdhury6, Wichor M Bramer4, Jessica C Kiefte-de Jong3,7, Janine F Felix3,8, and Oscar H Franco3,8
Vitamin K

Phylloquinone (vitamin K1) synthesized by plants...cabbage, spinach & other green leafy vegetables, improved glycemic status in women with pre diabetes before menopause.

Vitamin K2 is synthesized by the gut microbes

Osteoporosis : Vitamin K

- Long-term vitamin K inadequacy is an independent, but modifiable risk factor for the development of degenerative diseases of aging including osteoporosis and atherosclerosis.

- Cooked dark green vegetables are the richest dietary sources of vitamin K.

Vit K benefits bones, eyes, blood vessels and brain cells

- In combination with Ca+, Mg+ and vit D, vit K helps maintain bone mass and prevent bone loss with aging.

- Vit K benefits cardiovascular health by preventing Ca+ accumulation in blood vessels thus preventing hardening of the arteries.

- Vit K contributes to both brain and eye health. Vitamin K helps reduce the risk of developing age-related dementia and macular degeneration.

Alan Titchenal, Ph.D., C.N.S. and Joannie Dobbs, Ph.D., C.N.S. Department of Human Nutrition, Food and Animal Sciences, College of Tropical Agriculture and Human Resources, UH-Manoa.
Low Magnesium and risk of Pre Diabetes

Low serum magnesium levels are associated with an increased risk of pre diabetes, with comparable risk estimates to that of T2D.

Magnesium Intake and Lower Fasting Glucose and Insulin

- Every increase of 50 mg/day of Mg intake was associated with decreasing levels of both fasting glucose and fasting insulin.

- 1C of cooked spinach provides 150 mg of Mg. Almonds and soybeans are also good sources of magnesium.

J. Nutr. March 1, 2013 vol. 143 no. 3 345-353
Magnesium, stroke risk
Hypertension,

Magnesium-rich foods such as green leafy vegetables, beans, nuts and whole-grains may lower stroke risk


Nitrate-Rich Vegetables increase plasma nitrate and nitrite concentrations and lower blood pressure in healthy adults

J. Nutr. jn229807; first published online April 13, 2016. doi:10.3945/jn.116.229807
Potassium & Blood Pressure

- Research indicates that increasing dietary potassium may be more important for healthful blood pressure than reducing sodium. It would reduce heart and kidney disease.

- High potassium foods are mainly vegetables, beans, and many fruits.

Benefits of Plant Foods

- Fiber, Resistant starch…Microbiome
- Phytochemicals / Flavonoids / Antioxidants
- Nutrient - Dense
- Provide all 6 taste sensations
- It is the position of the American Diabetes Association that there is not a “one-size-fits-all” eating pattern for individuals with diabetes.
“To eat is a necessity, but to eat intelligently is an art”

La Rochefoucauld, Maxims, 1665
“Leave your drugs in the chemist’s pot if you can heal the patient with food.”

Hippocrates
“Let food be thy medicine and medicine be thy food.” ~ Hippocrates
Websites

- NutritionFacts.org
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Short-Term Low-Carbohydrate High-Fat Diet in Healthy Males Renders the Endothelium Susceptible to Hyperglycemia-Induced Damage, An Exploratory analysis by Cody Durrer, Nia Lewis, Zhongxiao Wan, Philip N. Ainslie, Nathan T. Jenkins and Jonathan P. Little; *Nutrients* 2019, *11*(3), 489;