Plant-Based Diets for Preventing & Managing Type II Diabetes

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Outline







DISCUSS CURRENT RESEARCH



WHAT CAN THE RD DO?

WHY IS THIS IMPORTANT?

DIABETES REVIEW & PLANT-BASED DIET REVIEW

Type 2 Diabetes: What

- Chronic condition that results in too much sugar in the blood
- Risk factors
 - Overweight/obese
 - Sedentary lifestyle
 - Family history
 - ► Age, race

Symptoms

- Increased hunger, thirst, urination
- Blurred vision
- Poor wound healing
- ► Fatigue

Type 2 Diabetes: Why It Matters

▶ 30 million adults with T2D

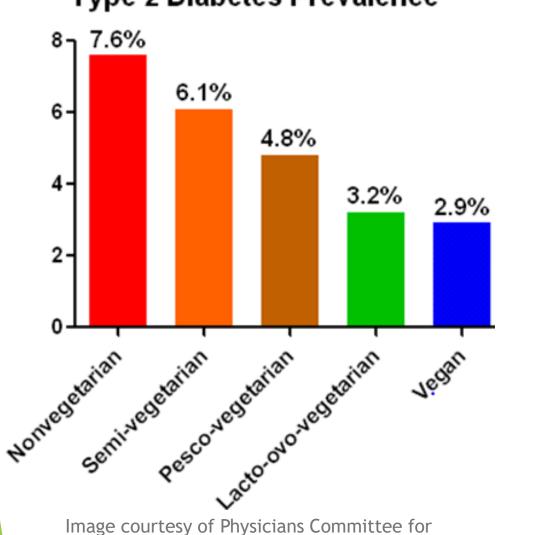
85 million with prediabetes

Methods to manage diabetes:

- Regular blood glucose monitoring
- Weight loss
- Diet & exercise
 - Carbohydrate counting
- Medication, insulin
 - Individual cost ~ \$9,000 per year



Past Research



Responsible Medicine

Type 2 Diabetes Prevalence

Prevention:

- Diabetes prevalence 46-74% lower on a plant-based diet (McMacken, 2017)
- Management:
 - Reduced glycemia
 - Reduced blood pressure & lipids
 - Weight loss

The Whole-Foods, Plant-Based Diet

Excludes animal products

- Emphasizes primarily natural, complete foods
- Low in fat, cholesterol, calories





Image courtesy of nutritionfacts.org







A Typical Day

- Breakfast: Avocado Toast & Smoothie
- Lunch: Garden Stir Fry
- Dinner: Vegetable & Hummus Wrap
- Snacks: Chia Seed Pudding, Popcorn, Fruit Salad

Images courtesy of Cooking Light

Study 1: A Plant-Based Dietary Intervention Improves Beta-Cell Function and Insulin Resistance in Overweight Adults: A 16-Week Randomized Clinical Trial

Authors: Kahleova H., Tura A., Hill M., Holubkov R., & Barnard N Journal: Diabetes Journal

Date: July 2018

Could a plant-based dietary intervention improve beta-cell function & insulin sensitivity in overweight adults with insulin resistance, but no history of diabetes?

Study 1: Participants

75 participants, 25 - 75 years old

Inclusion:

Overweight / obese (BMI 25-40)

Exclusion:

History of diabetes

Current vegetarian or vegan diet

Study 1: Design

- Randomly assigned to intervention or control group for 16 weeks
 - No changes to physical activity or medications
 - ▶ Kept a diet record
- Intervention group:
 - ▶ n = 38
 - Low-fat, vegan diet & B12 supplement
- Control group:
 - ▶ n = 37
 - No changes to diet

Study 1: Measurements

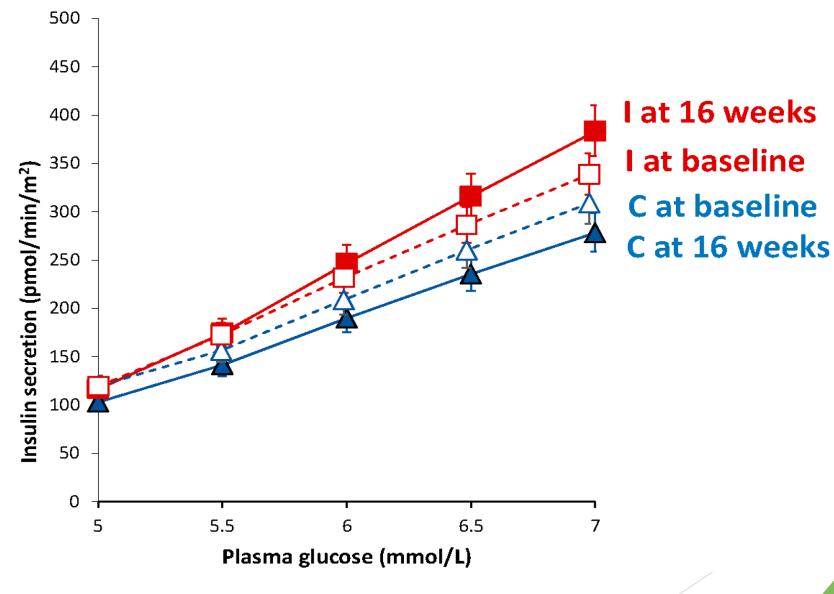
Primary outcomes

- Beta-cell function
- Insulin resistance

Secondary outcomes

- Anthropometrics
- Cholesterol
- Plasma glucose

Study 1: Results



Study 1: Results

Variable	Control Baseline	Control Week 16	Intervention Baseline	Intervention Week 16	P-value
BMI	33.6	33.4	33.1	31.2	<0.001
Lean Mass (kg)	49.8	48.8	50.6	48.3	0.002
Fat Mass (kg)	39.1	39.5	42.0	38.1	<0.001
Visceral Fat Volume (cm³)	1434	1459	1289	1090	<0.001
Cholesterol (mmol/L)	5.4	5.3	5.4	4.8	0.02
Fasting Glucose (mmol/L)	5.5	5.6	5.3	4.9	<0.001

Study 1: Analysis

Strengths

- Randomized, parallel design
- Ample time to adjust to diet
- Low attrition
- Applicable outside research setting

Limitations

- Self-reports
- Diet records only at baseline & 16-weeks
- Doesn't assess long-term effects

A low-fat, plant-based diet for diabetes prevention addresses both pathophysiologic mechanisms of diabetes: beta-cell dysfunction & insulin resistance.

Study 2: The BROAD Study: A Randomized **Controlled Trial Using a Whole Food** Plant-Based Diet in the Community for **Obesity, Ischemic Heart Disease or** Diabetes

Authors: Wright N., Wilson L., Smith M., Duncan B., & McHugh P.

Journal: Nutrition & Diabetes Journal

Date: March 2017

Study 2: Research Purpose

Can a community-based education program on a whole-food, plantbased diet affect BMI & cholesterol in community-dwelling adults?

Wright N., Wilson, L., et al.

Study 2: Participants

- 65 participants from general practice clinic
 - Inclusion:
 - Overweight / obese (BMI 25-40)
 - Diagnosis of 1+ :
 - ►T2D
 - Heart disease
 - Hypercholesterolemia or hypertension
 - Exclusion:
 - Life-threatening comorbiditiesMental health disorders

Wright N., Wilson, L., et al.

Study 2: Design

- Randomly assigned to intervention or control group for 12 weeks
- Intervention group:
 - ▶ n = 33
 - Attend plant-based nutrition education program
 - Follow non-energy restricted, plant-based diet & B12 supplement
- Control group:
 - ▶ n = 32
 - Receive normal medical care

Wright N., Wilson, L., et al.

Study 2: Measurements

Primary outcomes

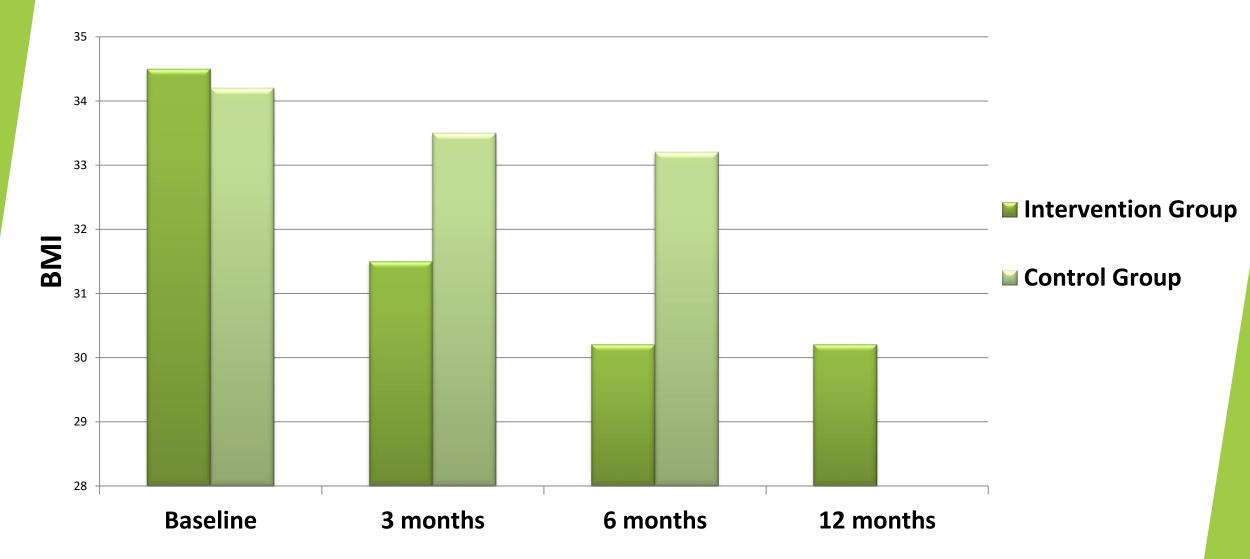
- BMI
- Cholesterol

Secondary outcomes

- Changes in medication use
- Quality of life
- CVD risk factors

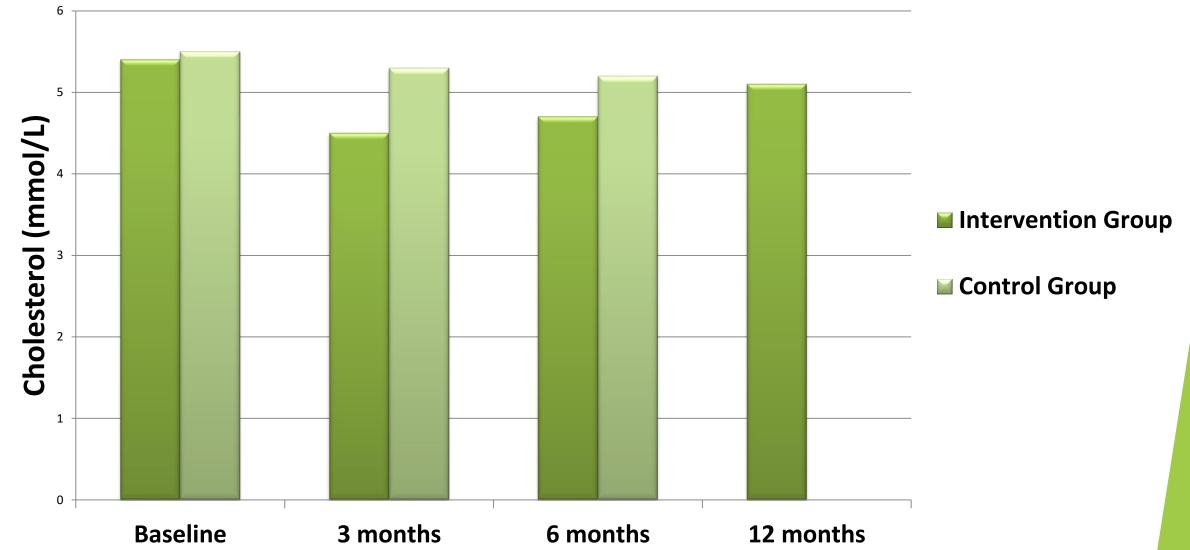


Mean BMI Values





Mean Value Cholesterol



Study 2: Results

Control Group:



QoL: physical improvement at 6 months Intervention Group:

29% decrease in medications

QoL: physical & mental improvement at 6, 12 months

Decreased CVD risk factors (p=0.02)

Study 2: Analysis

Strengths

- Randomized trial
- 2-week washout period
- Applicable outside research setting
- Low attrition

Limitations

- All participants received some plantbased diet education
- Control group received increased testing

Study 2: Conclusions

A 12-week plant-based nutrition program lead to significant & sustainable reduction of metabolic comorbidities at all measurement points, compared to those receiving normal care.

Study 3: A Plant-Based Meal Stimulates Incretin & Insulin Secretion More Than an Energy- & Macronutrient-Matched Standard Meal in Type 2 Diabetes: A Randomized Crossover Study

Authors: Kahleova H., Tura A., Klementova M., Thieme L., Haluzik M., Pavlovicova R., Hill M., & Pelikanova T.

Journal: Diabetes Journal

Date: February 2019

Study 3: Research Purpose

What are the effects of M-meal versus a V-meal that are energy & macronutrient matched on postprandial incretin & insulin secretion?

Study 3: Participants

> 20 men, aged 30 - 65 years

Inclusion:

► T2D diagnosis for 1+ years

▶ 3+ symptoms of metabolic syndrome

Exclusion

Renal, liver, thyroid disease

Significant weight loss in last 3 months

Study 3: Design

Randomly assigned to V-meal or M-meal

Overnight fast, no diabetic medications

Meal	M-meal	V-meal	
Energy (kcal)	513.6	514.9	
Carbohydrates (g) (%)	55 (44.8%)	54.2 (44.0%)	
Sugar (g) (%)	21 (17%)	4 (3%)	
Proteins (g) (%)	20.5 (16.7%)	19.9 (16.2%)	
Lipids (g) (%)	22 (38.6%)	22.8 (39.8%)	
Saturated fat (g)	8.6	2.2	
Fiber (g)	2.2	7.8	

Study 3: Measurements

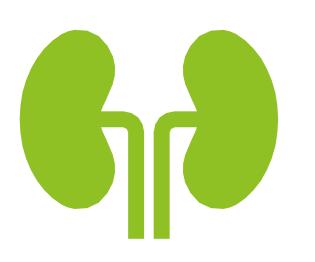
Primary outcomes

• Postprandial insulin & incretin secretion

Secondary outcomes

- Insulin resistance
- Beta-cell function

Terms to Know



► GIP & GLP-1:

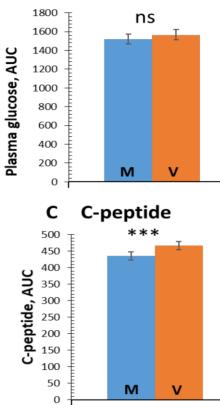
Incretin hormones that stimulate insulin secretion

Amylin: Secreted with insulin; satiety agent

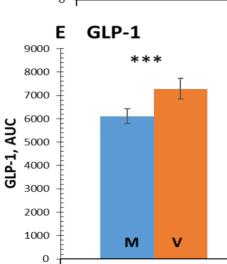
C-peptide: Helps to form insulin; secreted at equal concentrations with insulin

Study 3: Results

Plasma glucose Α

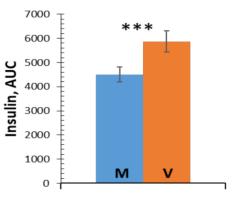


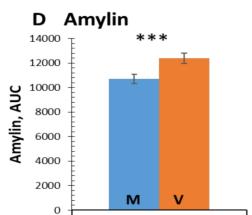
P-values are marked as ns for $p \ge 0.5$, * *p* < 0.05, and *** *p* < 0.001.

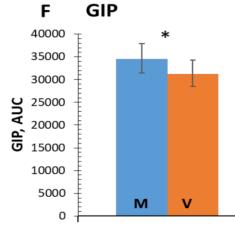


GLP-1,









Study 3: Analysis

Strengths

- Randomized
- Commonly consumed meals
- Repeated measurements

Limitations

- Short-term diabetes diagnosis
- Doesn't reflect habitual dietary patterns
- Small sample size

Study 3: Conclusions

Improvement of postprandial incretin & insulin secretion was found in T2D patients following a plant-based meal, suggesting the immediate, therapeutic effect of a plant-based diet in improving beta-cell function.

Other Research

Effect of a Brown Rice Based Vegan Diet & Conventional Diabetic Diet on Glycemic Control of Pts with T2D

► 16-weeks

HgbA1c significantly lower in vegan group than conventional diabetic diet

A Low-fat Vegan Diet & Conventional Diabetes Diet in the Treatment of T2D

► 74-weeks

Both diets showed sustained changes in weight & lipid reductions

Vegan diet showed glycemia reductions

What Can We Do?



RD Resources for Con Protein in V

Protein is a nutrient mad the building blocks for m In celiac disease (CeD); an autor called gluten damages the insit structures, including mut damage often results in poor al hair. They also play a role it is not treated with a gluten fr many substances that yo go about its everyday bu

Having CeD means zero tolerance for rye, and barley are good protein soun Some amino acids that cannot healthy nutrients, yet for those with C are termed "essential." We mus optimal health is to avoid these gluter we eat, it is not difficult to me. foods on a vegetarian or vegan diet. that vegetarians and vegans u What if you are a vegetarian or vegan their protein requirements. Yo Here are some key nutrients to keep it on including protein-rich food combining these diets. throughout the day.

Plant Proteins

Most plant foods, with the exception of soy, quinca, and spinach, may be low in one or two of the essential amino acids, but you can get enough of all these amino acids by including a variety of whole plant foods in your diet plant proteins needed to be di

Calcium and Vitamin D Temporary lactose intolerance may result when small intestinal damage leads to the loss of enzymes that digest dairy products. Calcium and vitamin D are two nutrients in dairy. A primary role for calcium is to build and maintain bones. and teeth and aid in blood





RD Resources for Consumers:

RD Resources for Consume Therapeutic Use of Vegetarian/Vegan **Combining Ve Diets in Chronic Disease** and Gluten-Fr

Well-balanced vegetarian diets reduce risks of many chronic diseases, and may treat. improve or reverse obesity, heart disease, high blood pressure, type 2 diabetes, and some digestive problems. They also offer promise in treatment for cancer and kidney disease.

Overweight / Obesity

The high fiber and nutrient density (more nutrients for fewer calories) of vegetarian diets may support healthy weight loss. The fiber in

beans, whole grains, fruits and vegetables may slow eating speed and food intake, which may provide longer-term fullness after meak; nutrient density may help limit hunger and cravings. Since obesity is a risk factor for most conditions discussed below, losing weight aids treatment of these other conditions.

Heart Disease

Vegetarian diets help treat heart disease by addressing obesity, and the low saturated fat content of plant foods helps your body reduce cholesterol production. Eating foods with soluble fiber in foods like bear

Type 2 Diabetes

Weight loss helps treat diabetes as well: in fact, losing only 5-10% of your body weight tends to lower blood sugar. The high fiber content

found in a vegetarian diet helps control blood sugar swings after meals, and the resulting fullness helps control portions, hunger cravings, and blood sugar spikes. Eating more whole grains may also supply greater amounts of nutrients. essential to help your body use blood sugar more efficiently.

Hypertension



sodium. Emphasize home-prepared foods with minimal added salt or salty ingredients. Reduce high sodium foods like bread, breakfast cereals, cheese, bottled sauces, salad dressings, soups, processed foods and restaurant meals. Additionally, most fruits, vegetables and especially beans are high in potassium, magnesium and other compounds that help support healthy blood pressure

Image courtesy of Academy of Nutrition & Dietetics

Offer plant-based diet as prevention & treatment option

AND endorses use of plantbased diets (Vesanto, et al, 2016)



- Recipes
- Food sources of vital nutrients

Supplements

Losing weight also reduces blood pressure. Choose unprocessed plant foods as they are naturally low in



www.plantbasedonabudget.org

www.vegetariannutrition.net

www.plantbaseddietitian.com

References

Solomon, T.P.J.; Haus, J.M.; Kelly, K.R.; Rocco, M.; Kashyap, S.R.; Kirwan, J.P. Improved Pancreatic Beta-Cell Function In Type 2 Diabetics Following Lifestyle-Induced Weight Loss Is Related To Glucose-Dependent Insulinotropic Polypeptide. *Diabetes Care* **2010**.

Melina, V., Craig, W., & Levin, S. (2016). Position of the Academy of Nutrition and Dietetics: Vegetarian Diets. *Journal of the Academy of Nutrition and Dietetics*, *116*(12), 1970-1980. <u>https://doi.org/10.1016/j.jand.2016.09.025</u>

Type 2 Diabetes. (2019). Retrieved from www.cdc.gov/diabetes/basics/type2.html

Trapp, C., & Levin, S. (2012). Preparing to Prescribe Plant-Based Diets for Diabetes Prevention and Treatment. *Diabetes Spectrum*, 25(1), 38-44. <u>https://doi.org/10.2337/diaspect.25.1.38</u>

McMacken, M., & Shah, S. (2017). A plant-based diet for the prevention and treatment of type 2 diabetes. *Journal of Geriatric Cardiology*: *JGC*, *14*(5), 342-354. <u>https://doi.org/10.11909/j.issn.1671-5411.2017.05.009</u>

Kahleova, H., Tura, A., Hill, M., Holubkov, R., & Barnard, N. (2018). A Plant-Based Dietary Intervention Improves Beta-Cell Function and Insulin Resistance in Overweight Adults: A 16-Week Randomized Clinical Trial. Nutrients, 10(2), 189. doi: 10.3390/nu10020189

References

Kahleova, H., Tura, A., Hill, M., Holubkov, R., & Barnard, N. (2018). A Plant-Based Dietary Intervention Improves Beta-Cell Function and Insulin Resistance in Overweight Adults: A 16-Week Randomized Clinical Trial. *Nutrients*, *10*(2), 189. doi: 10.3390/nu10020189

Lee, Y.-M., Kim, S.-A., Lee, I.-K., Kim, J.-G., Park, K.-G., Jeong, J.-Y., ... Lee, D.-H. (2016). Effect of a Brown Rice Based Vegan Diet and Conventional Diabetic Diet on Glycemic Control of Patients with Type 2 Diabetes: A 12-Week Randomized Clinical Trial. Plos One, 11(6). doi: 10.1371/journal.pone.0155918

Barnard, N. D., Cohen, J., Jenkins, D. J., Turner-Mcgrievy, G., Gloede, L., Green, A., & Ferdowsian, H. (2009). A low-fat vegan diet and a conventional diabetes diet in the treatment of type 2 diabetes: a randomized, controlled, 74-wk clinical trial. The American Journal of Clinical Nutrition, 89(5). doi: 10.3945/ajcn.2009.26736h

Wright, N., Wilson, L., Smith, M., Duncan, B., & Mchugh, P. (2017). The BROAD study: A randomised controlled trial using a whole food plant-based diet in the community for obesity, ischaemic heart disease or diabetes. Nutrition & Diabetes, 7(3). doi: 10.1038/nutd.2017.3



Questions?

Thank You!

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