

Plant-Based Eating Patterns for Diabetes

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The Physicians Committee for
Responsible Medicine
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Objectives

- List various recommended eating patterns for diabetes.
- Discuss the benefits of plant-based nutrition for diabetes.
- Describe how to implement a plant-based eating in clinical practice

Diabetes Statistics

- 30.3 million have diabetes (9.4%)
- 84.1 million have pre diabetes (11.6%)
- \$327 billion cost to US economy
- High intangible cost on society

Eating Patterns for Diabetes

- Mediterranean diet
- Dietary Approaches to Stop Hypertension (DASH)
- Low-carbohydrate diet
- Paleo diet
- Ketogenic diet
- Plant-based (vegetarian/vegan)



Vegetarian and Vegan Diets

Vegetarian Diets

- Vegan diet – 2%
- Vegetarian diet – 5%



Standards of Medical Care in Diabetes American Diabetes Association 2009-2019

“The Mediterranean, Dietary Approaches to Stop Hypertension (DASH), and plant-based diets are all examples of healthful eating patterns that have shown positive results in research....”



Standards of Medical Care in Diabetes - 2019.
Diabetes Care 2019. 42:S1-S193.



LIFESTYLE THERAPY

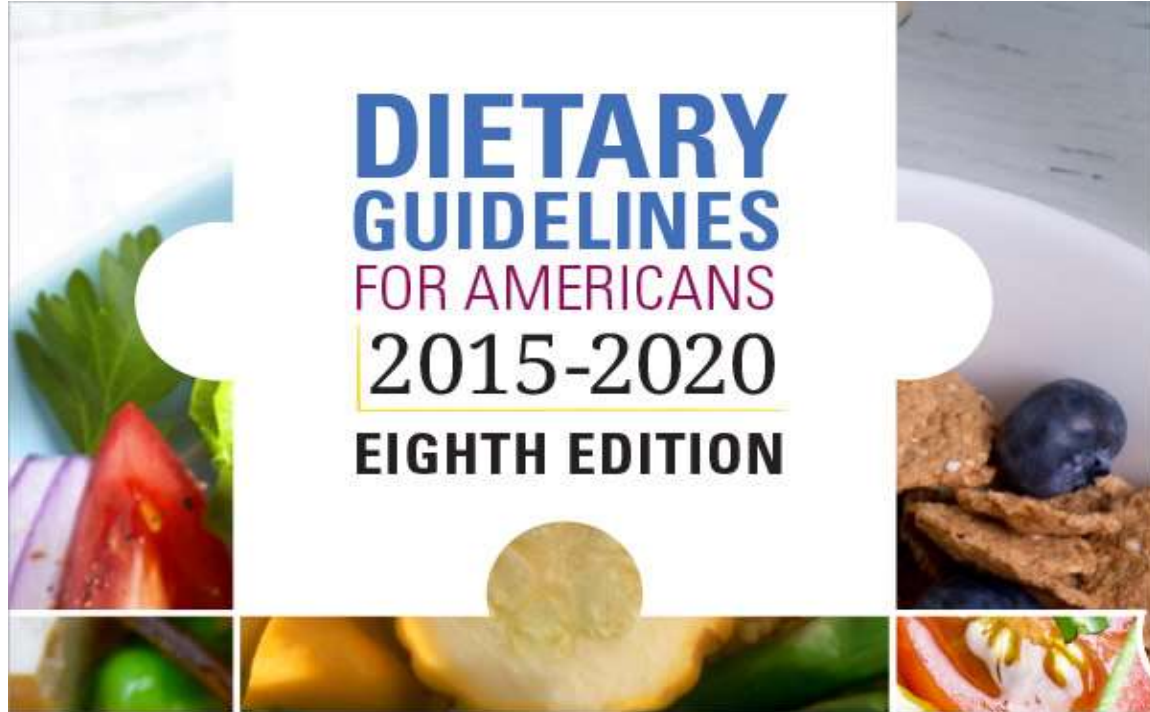
RISK STRATIFICATION FOR DIABETES COMPLICATIONS



INTENSITY STRATIFIED BY BURDEN OF OBESITY AND RELATED COMPLICATIONS



Dietary Guidelines for Americans



Position of AND

“...appropriately planned vegetarian, including vegan, diets are healthful, ***nutritionally adequate***, and may provide health benefits in the prevention and treatment of certain diseases.”



Academy of Nutrition
and Dietetics

THE LANCET

January 2019

www.thelancet.com

Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems



"Food in the Anthropocene represents one of the greatest health and environmental challenges of the 21st century."

Vegetarians have a Higher Diet Quality

Higher in:

- Fiber
- Vitamins A, C, E
- Calcium
- Magnesium
- Iron
- Thiamin
- Riboflavin
- Folate

Lower in:

- Calories
- Total and saturated fat
- Cholesterol
- Sodium
- Protein
- Vitamin B12
- Zinc
- Niacin

Vegetarians and Vegan Diets

Improve Risk Factors:

- Body weight
- Abdominal obesity
- Blood pressure
- Serum lipids
- Markers of inflammation
- Glucose levels

Reduce Risk of:

- Cardiovascular disease
- Diabetes
- Mortality
- Cancer
 - All
 - Colon
 - Prostate

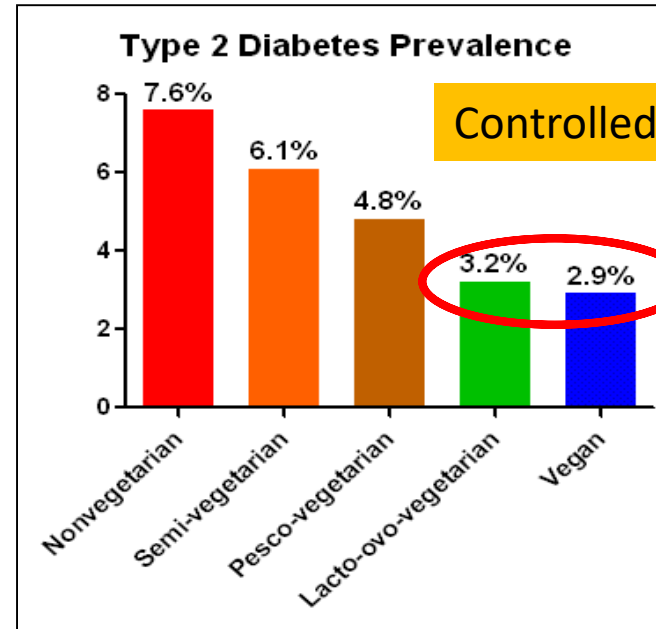
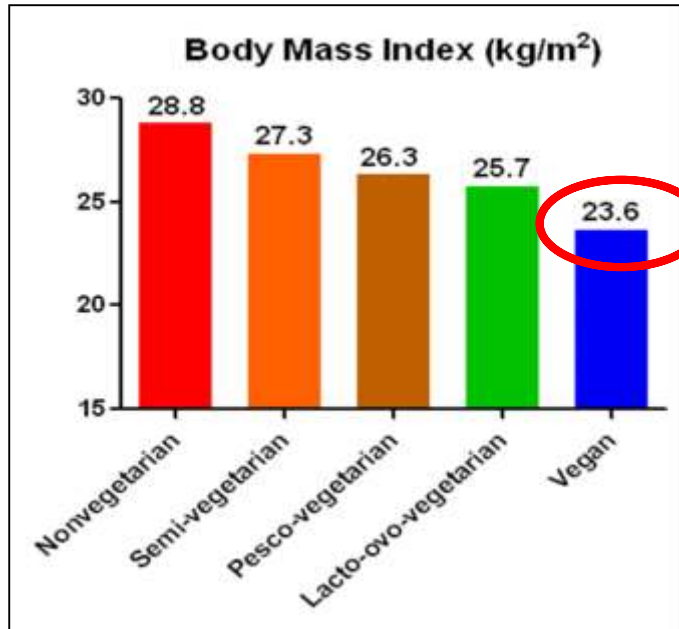
7th Day Adventist

- Christian denomination
- Encouraged to be healthy
- Encouraged to be vegetarian (about 50% are)
- Sets up a natural experiment to evaluate eating patterns and health outcomes
 - Adventist Mortality Study (40% to 80% ↑ DM risk)
 - Adventist Health Study 1
 - Adventist Health Study 2 - >100,000 (ages 30-112)

Snowdon et al. *AJPH* 1985;75:507-512.

Le et al. *Nutrients*. 2014;6:2131-2147.

Adventist Health Study – 2 (N=60,903)



Lacto-ovo Vs. Vegan AHS-2

	Lacto-ovo	Vegan
BMI	3 points lower	5 points lower
HTN	55% less	75% less
T2DM	38% to 61% less	49% to 78% less
All-Cause Mortality	9% lower	15% lower
CVD mortality	23% to 42% lower	55% lower

Meat Consumption and Diabetes

- Nurses Health Study I and II
- Health Professionals' Follow up study
- European Prospective Investigation into Nutrition and Cancer
- NHANES



Satija A, et al. PLoS Med. 2016;13:e1002039.

Pan A, et al. JAMA. 2013;173:1328-1335.

van Nielen et al. Diabetes Care 2014;37:1854-1862.

Sluijs et al. Diabetes Care. 2010;33:43-48

Wang et al. Int J Obes (lond). June; 33(6):621-628

Intensive Lifestyle Intervention (NIH funded)

- 22 week RCT of 99 individuals with T2D:
 - Low-fat vegan group (N=49)
 - Consume from “4 food groups”
 - Avoid all animal produces
 - Low-fat, low glycemic index
 - **No portion control**
 - Control group (ADA: portion control of CHO, -500 kcal/day)
 - Both groups received intensive lifestyle therapy.



Results at 22 weeks

	Vegan Group N=49	Control Group N=50	P Value
Carbohydrate Intake	Increased	Decreased	
Fiber intake	Doubled	unchanged	
Reduced Medications	43%	26%	0.01
Change in A1C	↓0.96	↓0.56	0.089
Change in A1C (those w/o med Δ)	↓1.23	↓0.38	0.01
Body Weight	↓6.5 kg	↓3.1 kg	< 0.001
Change in LDL	↓22.6 mg/dl	↓10.7 mg/dl	0.02
AHEI Score	↑↑	unchanged	P<0.0001

**How is a plant-based diet (PBD)
beneficial?**

Potential Mechanisms: Effects on Insulin Resistance/ Beta-cell Function

Plant-Based Diet

Diet Quality

Fiber

Antioxidants and
Phytochemicals



Low-GI



Polyphenols

Anti-inflammatory

Vitamins/Minerals



Animal-Based Diet

Saturated Fats
and *trans* fats

Heme-iron

Protein

AGE



Dysbiosis

Nitrates/Nitrites

Insulin Resistance
Beta-cell Dysfunction

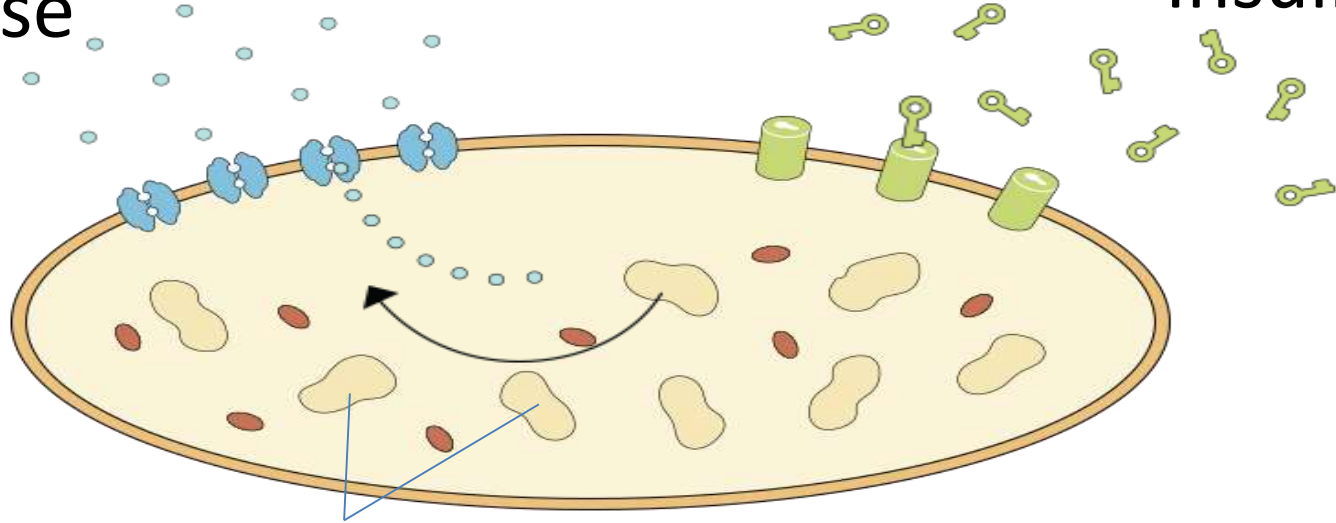


Chiuev SE, et al J Nutr. 2012;142:1009-1018.
Wolfram T. Endocr Pract., 2011;17:132-142.
Kim y. Nutrients. 2016;8:17.
Radulian G. Nutr J. 2009;8:5.
Estadella D. Mediators Inflamm. 2013;
doi.org/10.1155/2013/137579.
Wolk. J Intern Med. 2017;281:106-122.
Serrano SE. Environ Health. 2014;13:43.

Inside the Cell

Glucose

Insulin



Intramyocellular lipid

When compared with omnivores (matched for age, BMI, body fat, energy intake, etc.), vegans have lower intramyocellular content and higher insulin sensitivity.

Kim Y, et al. Metabolism. 2015;64:768-779.

Article

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

Hana Kahleova ^{1,*}, Andrea Tura ², Martin Hill ³, Richard Holubkov ⁴ and Neal D. Barnard ^{1,5}

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³ Institute of Endocrinology, 11394 Prague, Czech Republic; mhill@endo.cz

⁴ School of Medicine, University of Utah, Salt Lake City, UT 84132, USA; richard.holubkov@hsc.utah.edu

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Received: 19 December 2017; Accepted: 5 February 2018; Published: 9 February 2018

Abstract: The aim of this study was to test the effect of a plant-based dietary intervention on beta-cell function in overweight adults with no history of diabetes. Participants ($n = 75$) were randomized to follow a low-fat plant-based diet ($n = 38$) or to make no diet changes ($n = 37$) for 16 weeks. At baseline and 16 weeks, beta-cell function was quantified with a mathematical model. Using a standard meal test, insulin secretory rate was calculated by C-peptide deconvolution. The Homeostasis Model Assessment (HOMA-IR) index was used to assess insulin resistance while fasting. A marked increase in meal-stimulated insulin secretion was observed in the intervention group compared with controls (interaction between group and time, G_{xt} , $p < 0.001$). HOMA-IR index fell significantly ($p < 0.001$) in the intervention group (treatment effect -1.0 (95% CI, -1.2 to -0.8); G_{xt} , $p = 0.004$). Changes in HOMA-IR correlated positively with changes in body mass index (BMI) and visceral fat volume ($r = 0.34$; $p = 0.003$ and $r = 0.42$; $p = 0.001$, respectively). The latter remained significant after

PBD Improves Beta Cell Function

- 16 week dietary intervention
- N=75, overweight adults randomized to:
 - Low-fat vegan diet
 - No dietary changes
- Intervention results:
 - ↑ in post meal stimulated insulin secretion occurred in the LFV group ($p < 0.001$)
 - ↓ in insulin resistance (HOMA-IR) ($p < 0.001$)



Article

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 Pavlovicova ¹, Martin Hill ⁴ and Terezie Pelikanova ¹

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⁴ Institute of Endocrinology, 11394 Prague, Czech Republic; mhill@endo.cz

* Correspondence: hkahleova@pcrm.org; Tel.: +1-202-527-7379

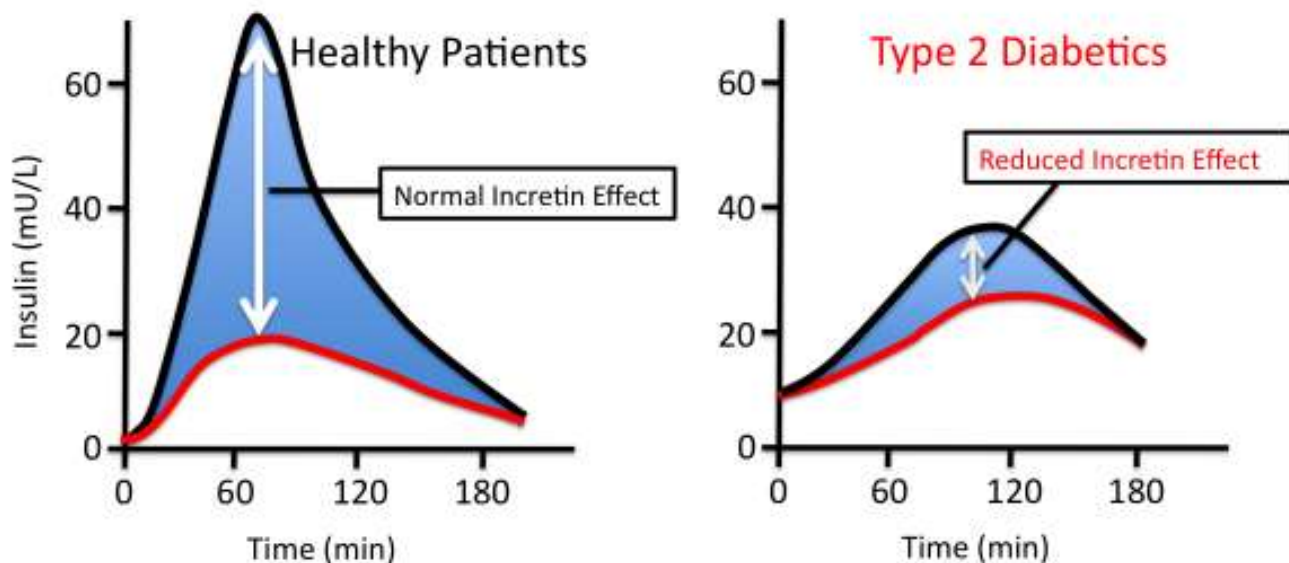
Received: 4 February 2019; Accepted: 21 February 2019; Published: 26 February 2019



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Abstract: Diminished postprandial secretion of incretins and insulin represents one of the key pathophysiological mechanisms behind type 2 diabetes (T2D). We tested the effects of two energy- and macronutrient-matched meals: A standard meat (M-meal) and a vegan (V-meal) on postprandial incretin and insulin secretion in participants with T2D. A randomized crossover design was used in 20 participants with T2D. Plasma concentrations of glucose, insulin, C-peptide, glucagon-like peptide-1 (GLP-1), amylin, and gastric inhibitory peptide (GIP) were determined at 0, 30, 60, 120, and 180 min. Beta cell function was assessed with a mathematical model using C-peptide

Diabetes & The “Incretin Effect”



— Oral Glucose (50 g/400 ml)
— Isoglycemic IV Glucose Infusion

Nauck M et al.
Diabetologia (1986) 29:46-52

Vegan Sandwich VS. Meat Sandwich

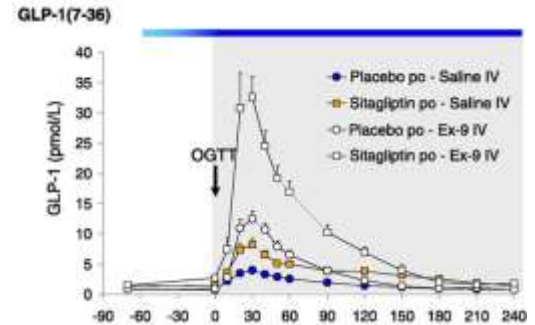


514.9 kcal
7.8 g fiber



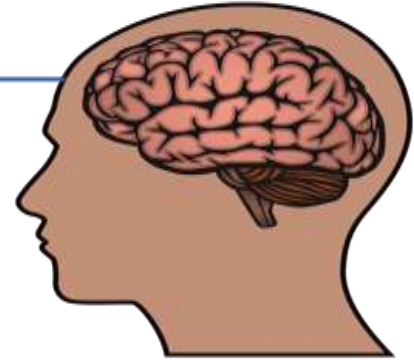
513.6 kcal
2.2 g fiber

- Macronutrient: 44% CHO, 20% protein, 39% fat
- Vegan meal increased **post prandial GLP-1 by 30.1%**
- Outcome similar to Sitagliptin



Fiber is Filling

Fiber tells your brain → **you're full.**



Carbohydrate has 4 calories/gram
Fat has 9 calories/gram



119 kcals

WHAT 500 CALORIES LOOKS LIKE

OIL



CHEESE



MEAT



GRAINS &
BEANS



FRUITS &
VEGGIES



Short Chain Fatty Acids (SCFA)

**Non-digestible
polysaccharides**



**Fermented by
gut bacteria**



SCFA:

- Butyrate
- Propionate
- Acetate

Esteve E, et al. *Curr Opin Clin Nutr Metab Care*. 2011;14:483-490

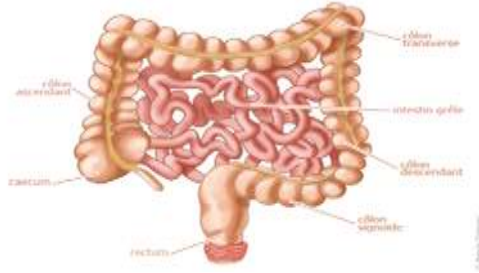
Shen J, et al. *Mol Aspects Med*. 2013;34:39-58

Tilg H, *J Clin Invest*. 2011;121(6):2126-2132

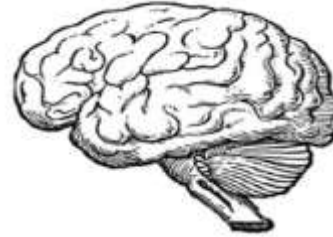
Bibiloni R, et al. *Ann Nestle Eng*. 2009;67:39-47

SCFA and Health

Enhance nutrient absorption
Improve gut barrier function



↓ Endotoxin
↓ Inflammation
↑ Release of gut peptides
↑ Glycemic control



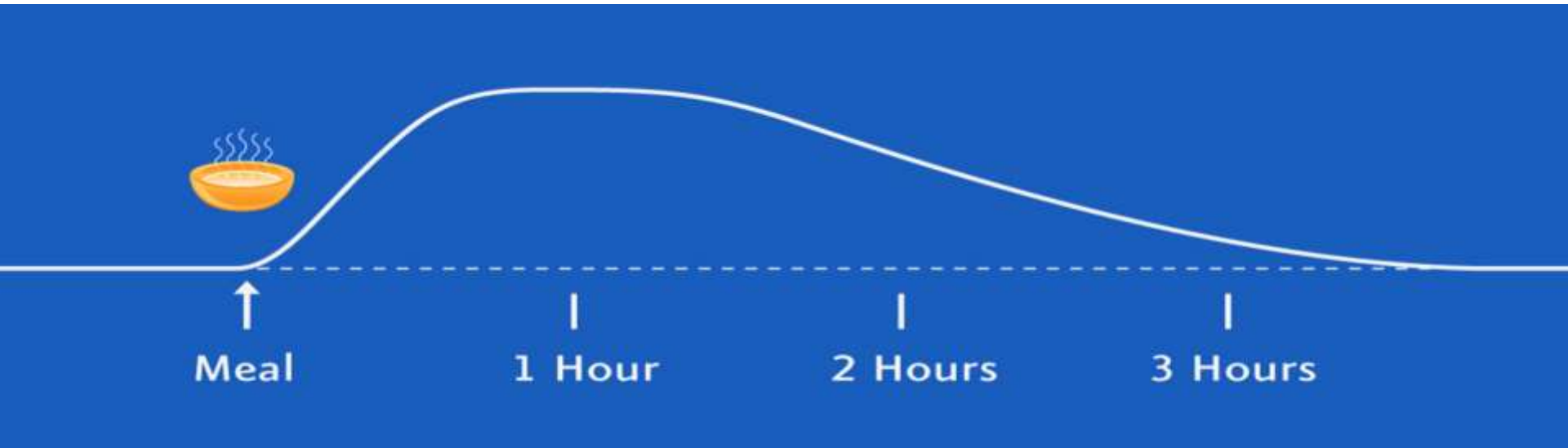
↑ Satiety
↓ Food intake



↑ FOX

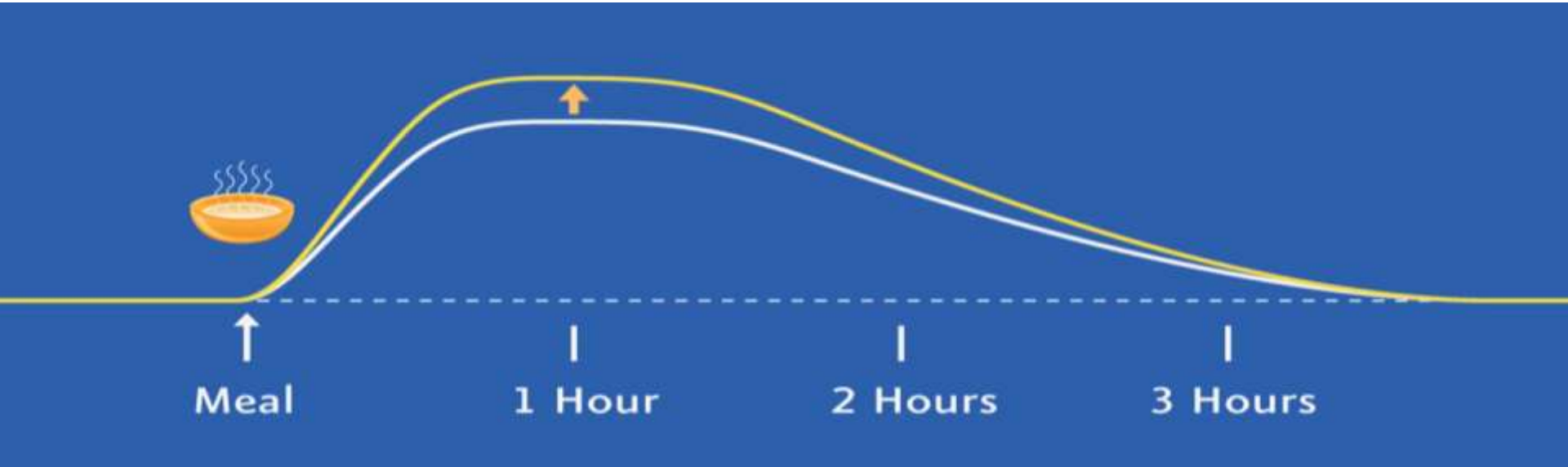
Cani PD, et al. Current Pharmaceutical Design. 2009;15:1546-1558
Allin KH, et al. Eur J Endocrinol. 2015;172:R167-R177
Tilg H, et al. Gut. 2014;63:1513-1521.
Conlon et al. Nutrients. 2015;7:17-44

The After-Meal Calorie Burn



Barnard ND, et al. *Am J Med* 2005;118:991-997.

The After-Meal Calorie Burn



Barnard ND, et al. *Am J Med* 2005;118:991-997.

Diabetes Remission Occurs with Calorie Restriction

Reversal of Diabetes

- Metabolic surgery
- Very-low-calorie diets
 - The Counterpoint Study – 640-700 kcal/d (50% remission)
 - Primary care-led weight management for remission of type 2 diabetes (DiRECT) – 825-853 kcal/d (46% remission vs 4% in control group)
 - Insulin sensitivity occurs within days
 - Beta cell function improves within weeks

Taylor, R. *Diabet Med.* 2012;30:267-275

Lean ME, et al. *Lancet* 2018; 391: 541–51

Effect of High-Fiber, Low-Fat Diet Without Weight Loss

- N=20 men with T2DM on insulin
- Metabolic ward
 - Control diet 7 days
 - Near-vegetarian diet (70% carbohydrate, 65 g fiber) 16 days
- Designed to maintain body weight

Results

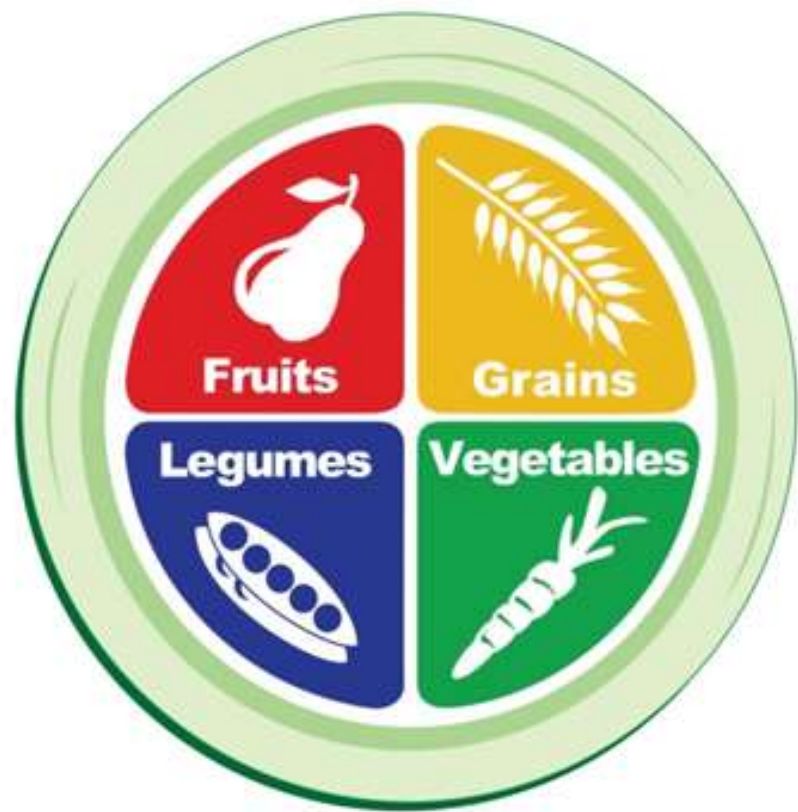
- No changes in body weight
- 9 out of 20 patients discontinued insulin
- Insulin was reduced: 26 ± 3 units/day to 11 ± 3 units per day ($P < 0.001$)
- Fasting and 3-hour postprandial glucose levels decreased significantly
- Cholesterol was reduced: 206 ± 10 mg/dL to 147 ± 5 mg/dL ($P < 0.001$)
- No significant increase in TG

Plant-Based Nutrition Summary

- Healthy weight
- Diet quality
- May restore beta-cell function
- High in fiber
- Incretin effect
- Healthy microbiota
- Enhances thermogenesis



Plant-Based Nutrition for Diabetes Implementation



Whole Grains 5-8 servings

- Intact grains: bran, endosperm, and germ
- Brown rice, wild rice, corn, oats, barley rye, whole wheat, whole grain pasta, teff
- Pseudo grains: amaranth, quinoa, buckwheat, millet



WHOLE GRAINS



Whole Grains

- ↓ Inflammation
- ↓ Body weight
- ↑ Insulin sensitivity
- ↓ T2DM risk
- ↓ Mortality (CV and DM)
- ↓ Cancer risk
- Improves microbiota: increases in healthy species and diversity
- Enhances the release of SCFAs



Gaf. Microb Ecol Health Dis. 2015;26:26164
Lefevre. Nutr Rev. 2012;70:387-396.
Wolfram. Endocr Pract. 2011;17:132-142.
Weickert. Am J Clin Nutr. 2011;94:459-471.
Cooper. Healthcare. 2015;3:364-392.

Legumes 2 + servings

- Nutrient dense
- Low glycemic index
- “Second-meal effect”
- Reduce adiposity



Becerra-Tomás. Clin Nutr. 2018;37:906-913
Jenkins. Am J Clin Nutr. 1982;35:1339-1346.



ELSEVIER

Contents lists available at ScienceDirect

Clinical Nutrition

journal homepage: <http://www.elsevier.com/locate/cinu>



Original article

In 4.3 years of follow up, individuals in the highest quartile of legume and lentil consumption had a 35% lower risk of diabetes than those in the lowest quartile

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^c Department of Preventive Medicine, University of Valencia, Valencia, Spain

^d Department of Internal Medicine, August Pi i Suñer Institute of Biomedical Research (IDIBAPS), Hospital Clínic, University of Barcelona, Barcelona, Spain

^e Cardiovascular Risk and Nutrition Research Group, Institut Hospital del Mar d'Investigacions Mèdiques, Barcelona Biomedical Research Park, Barcelona, Spain

^f Department of Clinical Sciences, University of Las Palmas de Gran Canaria, Las Palmas, Spain

^g Department of Cardiology, University Hospital Araba, Vitoria, Spain

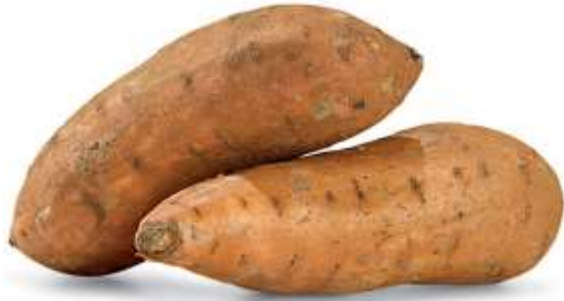
^h Department of Nutrition, Food Science and Gastronomy, School of Pharmacy and Food Science, INSA-University of Barcelona, Barcelona, Spain

ⁱ Institute of Health Sciences, University of Balearic Islands and Son Espases Hospital, Palma de Mallorca, Spain

^j of Family Medicine, Distrito Sanitario Atención Primaria Sevilla, Centro de Salud San Pablo, Sevilla, Spain

Fruits 3-4 servings

Vegetables 4-5 servings



Nuts and Seeds 1oz per day

- High in antioxidants
- High in polyphenols
- Source of essential fatty acids
- Inversely associated with diabetes



Principles of Plant-Based Nutrition

- Limit added vegetable oils and other high fat foods.
- Low glycemic index (GI) such as oatmeal, barley, quinoa, sweet potatoes, whole grains, rye or pumpernickel bread, beans, fruits, and vegetables.

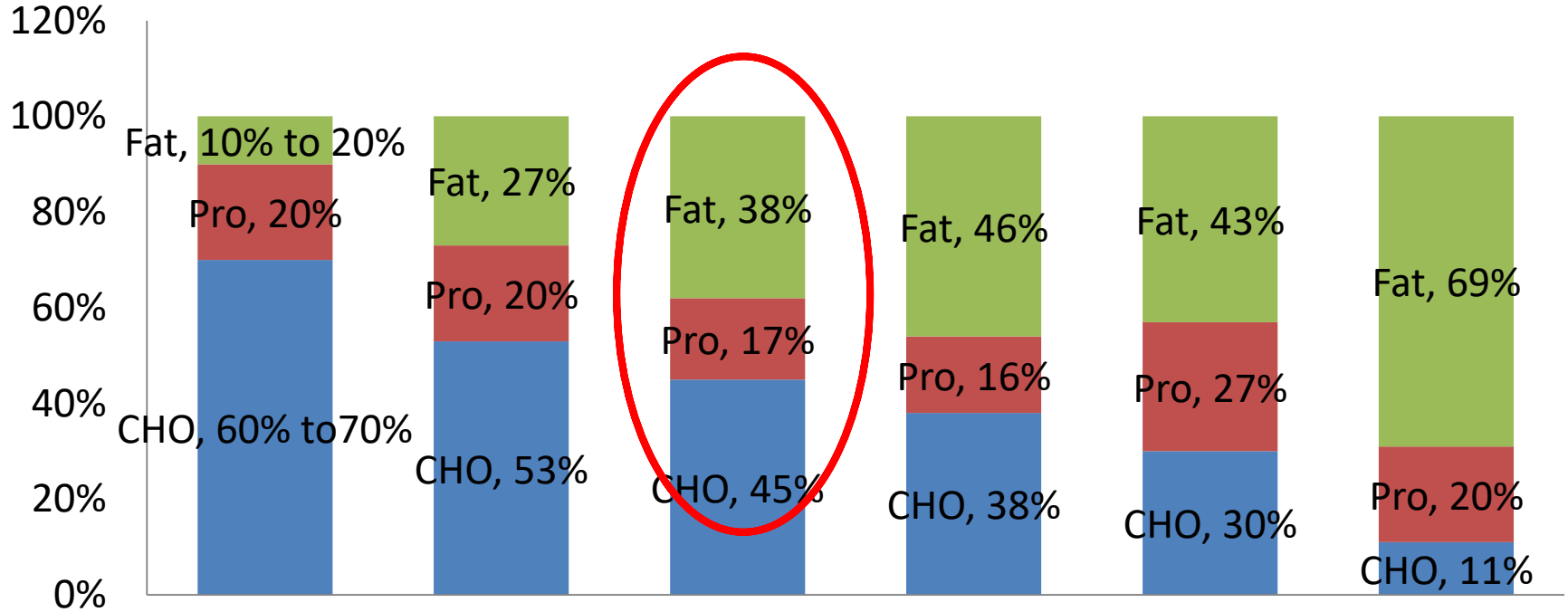
Principles of Plant-Based Nutrition

- Avoid all animal products (e.g., meat, chicken, fish, eggs, all dairy)
- Take a Vitamin B12 supplement
- Choose high-fiber foods



	Fiber Intake (g/day)
Current Intake of Americans	15
Recommendations	25-38
Plant-Based Nutrition	40

Macronutrient Mix



Low-Carbohydrate/High-Fat Diets

- Short term studies show significant \uparrow in post prandial glucose (OGTT) compared to a low fat diet (69% vs. 22%).
- Prospective studies show \uparrow in CVD and all-cause mortality.
- Fat displaces high-fiber foods, \downarrow quality.
- Increases proinflammatory species in gut

Numao S, et al. Eur J Clin Nutr. 2012;66:926-931.

Lagiou P. et al. BMJ. 2012;344:e4026.

Noto H, et al. PLoS One. 2013;8:e55030

Shouldn't we limit carbohydrate consumption in diabetes?

Historical Eating Patterns



Unrefined vs. Refined Carbohydrates

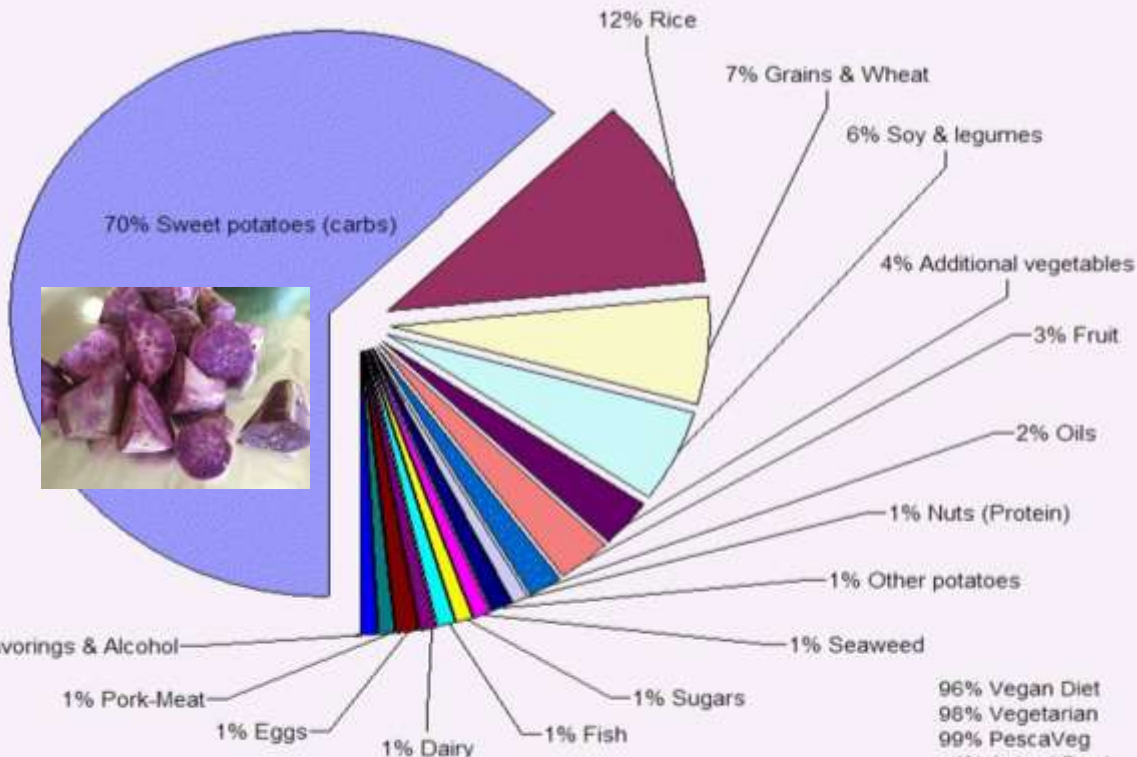


High in fiber, micronutrients, phytochemicals, and water

Highly processed, low in fiber, micronutrients, and phytochemicals

Okinawa Longevity Diet

- 70% Sweet potatoes (carbs)
- 12% Rice
- 7% Grains & Wheat
- 6% Soy & legumes
- 4% Additional vegetables
- 3% Fruit
- 2% Oils
- 1% Nuts (Protein)
- 1% Other potatoes
- 1% Seaweed
- 1% Sugars
- 1% Fish
- 1% Dairy
- 1% Eggs
- 1% Pork-Meat
- 1% Flavorings & Alcohol



85% carbs
09% Protein
06% Fat
85-10-5

1785 Calories

SCIENTIFIC STUDY: "The Diet of the World's Longest-Lived People and its Potential Impact on Morbidity and Life Span"
JOURNAL: Annals of the Academy of Sciences - Volume 1114: 434-455 (2007).

Note: These are the Actual Food Measurements of the Centenarians, not the diet of All island Okinawans or the ones who died, but the ones who lived.

96% Vegan Diet
98% Vegetarian
99% PescaVeg
<4% Animal Prod
<1% Fish
<1% Meat-Pork

Blue Zones

Lomo Linda, USA

Sardinia, Italy

Ikaria, Greece

Nicoya, Costa Rica

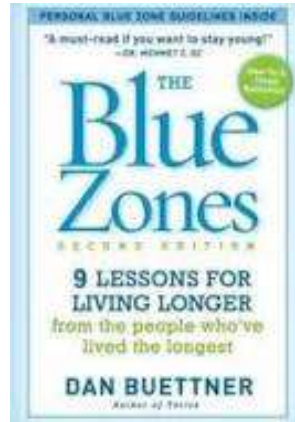
Okinawa, Japan



Blue Zones

“Power 9®”

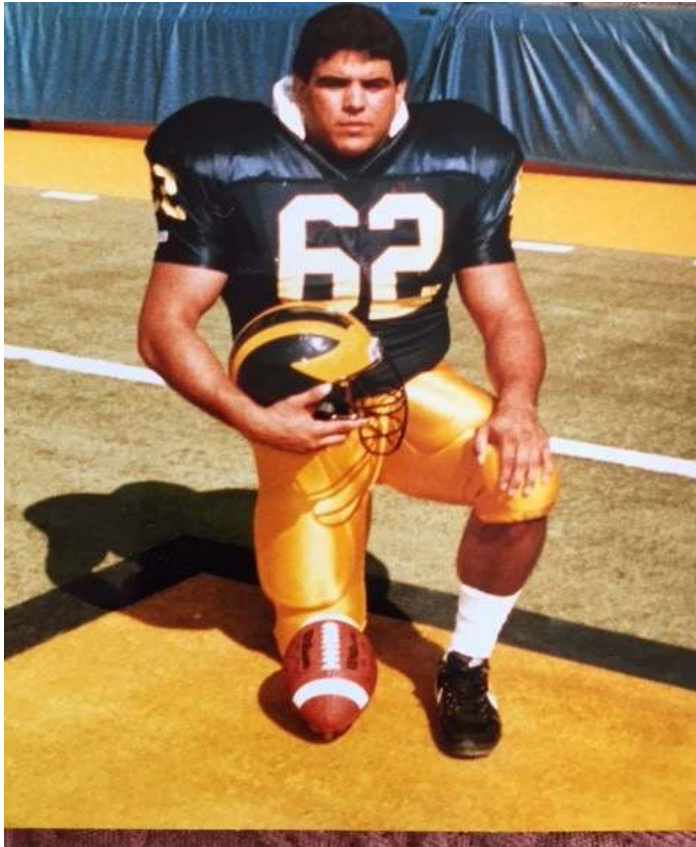
1. Move naturally
2. Purpose
3. Downshift
4. 80% Rule
5. Plant slant
6. Wine at 5
7. Belong
8. Loved ones first
9. Right tribe



Buettner D, Skemp S. Blue Zones: Lessons from the world's longest lived. 2016.
<https://doi.org/10.1177%2F1559827616637066>

Case Study

Marc Ramirez



Pre Plant-Based Diet

Diagnosed with Type 2 DM
in 2002

Medications (2011)

Lantus, Simvastatin,
Lisinopril, Metformin, and
Januvia



	9/9/2011	12/29/2011
Total Cholesterol (mg/dL)	164	104
Triglycerides (mg/dL)	192	111
HDL-C (mg/dL)	39	38
LDL-C (mg/dL)	87	44
A1C (%)	10.5	8.1

PBD 12/3/11
Changes after
26 days

2011 to 2019



- Lost 50 lbs
- A1C=5.5%
- Medication-free

<http://www.chickpeaandbean.com/>

Marc's Key to Success:

- 4 food groups
- No animal product
- Low-fat
- Low GI foods



Meal Planning for Success

Test Driving a Plant-Based Diet

- Introduce during your assessment
- Ease into it slowly/Spectrum approach
- 3-week trial of 100% plant-based eating:
 - Take 2 weeks to plan and try meatless meals and learn a few new recipes
 - Short-term commitment
 - Motivating results



Foods to Try

Breakfast

Lunch

Dinner

Snacks

Healthy Breakfasts



Lunches and Dinners



Phase 1 Dates: _____ to _____

Your Program's info here

In Phase 1, you'll focus on the basics: **fruits, vegetables, and beans**. These foods have lots of fiber that lowers blood glucose and helps you to lose weight.

Check off the items as you go. Get at least the indicated number of servings each day for each group. You can eat other foods and beverages too, but be sure to get these foods, plus exercise, in the recommended amounts every day.







	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Fruit (1 medium-sized fruit or 1 cup cut) 	○ ○	○ ○	○ ○	○ ○	○ ○	○ ○	○ ○
Vegetables (1 cup raw, large pieces; ½ cup chopped raw or cooked) 	○ ○	○ ○	○ ○	○ ○	○ ○	○ ○	○ ○
Beans & lentils (½ cup cooked beans, lentils) 	○	○	○	○	○	○	○
Water (One 12-ounce glass) 	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○	○ ○ ○
Exercise (30 minutes, 3+ days/week) 	○	○	○	○	○	○	○

Phase 2 Dates: _____ to _____

Your Program's info here

In Phase 2, you'll add **berries and leafy greens** to your daily routine.

Berries are incredibly rich sources of anthocyanins, compounds that fight diabetes, cancer, and inflammation. Dark green leafy vegetables are the healthiest foods on the planet.

		Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Berries (½ cup fresh or frozen)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other fruit (1 medium-sized fruit or 1 cup cut)		<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Leafy greens (1 cup raw; ½ cup cooked)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other vegetables (1 cup raw, large pieces; ½ cup chopped raw or cooked)		<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Beans & lentils (½ cup cooked beans, lentils)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water (One 12-ounce glass)		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Exercise (30 minutes, 4+ days/week)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>











Phase 3 Dates: _____ to _____

Your Program's info here

You're doing great! You're ready for the final additions: **cruciferous vegetables, whole grains, and ground flax seeds.**

Oatmeal, brown rice, and whole grain pasta can fill you up and keep you satisfied because they are terrific sources of fiber.

Sprinkle ground flax seeds on your oatmeal or salad. They'll help to fill you up and help protect against cancer too.

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Berries (½ cup fresh or frozen) 	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other fruit (1 medium-sized fruit or 1 cup cut fruit) 	<input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/>
Leafy greens (1 cup raw; ½ cup cooked) 	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cruciferous vegetables (½ cup chopped, 1 tbsp horseradish) 	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other vegetables (1 cup raw; ½ cup chopped raw/cooked) 	<input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/>
Beans & lentils (½ cup cooked beans, lentils) 	<input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/>
Whole grains (½ cup cooked grains, hot cereal; 1 cup cold cereal; 1 slice bread) 	<input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/>
Flax seeds (1 tbsp ground) 	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Water (One 12-ounce glass) 	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
Exercise (30 minutes, 5+ days/week) 	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

B12 Recommendations

- Fortified foods contain B12
- Vegans should have a reliable source:
 - 500 to 1,000 μg several times per week
 - Based on 1% (passive) absorption



Vitamin B12

- B12 Deficiency:
 - Elevated homocysteine: CVD risk
 - Macrocytic anemia: fatigue
 - Nerve damage: tingling in fingers and toes
 - Poor cognition, digestion, FTT
 - Stroke, dementia, and poor bone health
- Metformin is associated with vitamin B12 deficiency: periodic testing is recommended.

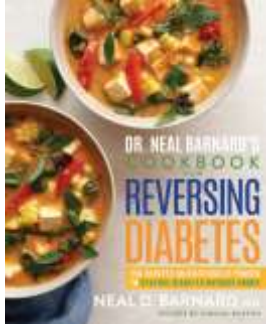
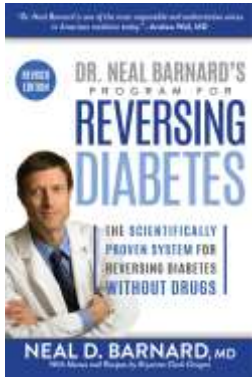
What Should Patients Expect?

- Blood glucose changes:
 - Hypoglycemia – review prevention, recognition, and treatment
 - Slow decrease in glucose over time
 - Hyperglycemia – focus on low-GI carbohydrates
- Reduction in blood pressure
- Reduction in cholesterol
- Medication changes may be needed

Why Do People Like It?

- No portion sizes
- No carbohydrate counting – except in T1D
- Major health benefits – addresses root cause
- Saves money

Websites and Books



<https://www.pcrm.org/>



- NutritionCME.org
- ForksOverKnives.com
- NutritionFacts.org

Being a Healthy Role Model

- Problem-solving
- Social support



July 25-27, 2019



International Conference on
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Today's Recipes

Taste of Asia Cole
Slaw



Yes You Can Black
Bean Chili



Tofu Scramble

Q & A
Thank you!