Creating Health: Applying the Science of Lifestyle Medicine
Mark Pettus MD

- Week 1: Epigenetics and Health: How well do you fit into your genes?
- Week 2: Inflammation: The bad gift that keeps giving
- *Week 3: Metabolic Health: How to become a member of this exclusive club*.
- Week 4: Circadian Rhythms and Health: Riding the rhythms of life

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Metabolic Health:

How to become a member of this exclusive club.

Mark Pettus MD
October 7, 2022

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"YOU NEVER CHANGE THINGS BY FIGHTING THE EXISTING REALITY. TO CHANGE SOMETHING, BUILD A NEW MODEL THAT MAKES THE EXISTING MODEL OBSOLETE."

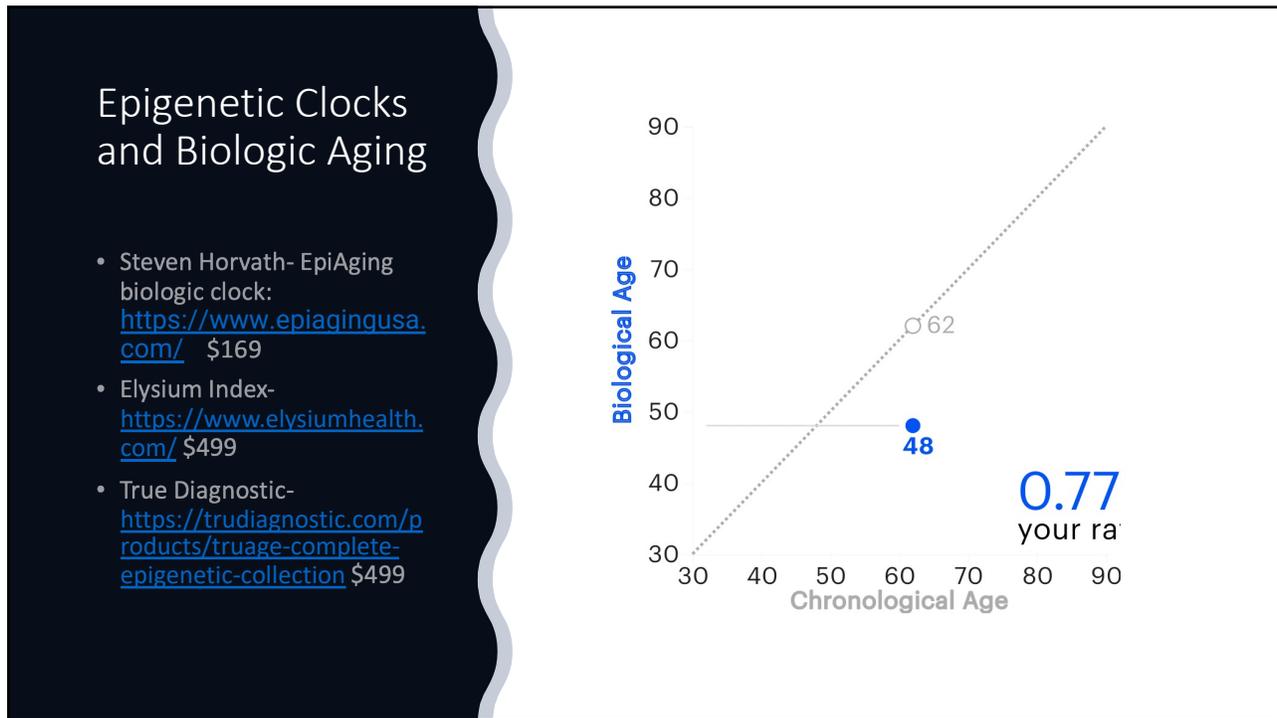- BUCKMINSTER FULLER

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Learning Objectives

- Understand the parameters that constitute metabolic health
- Understand the connection between poor metabolic health and an increased risk for MOST chronic, complex, contemporary diseases
- Understand the lifestyle disrupters of metabolic health
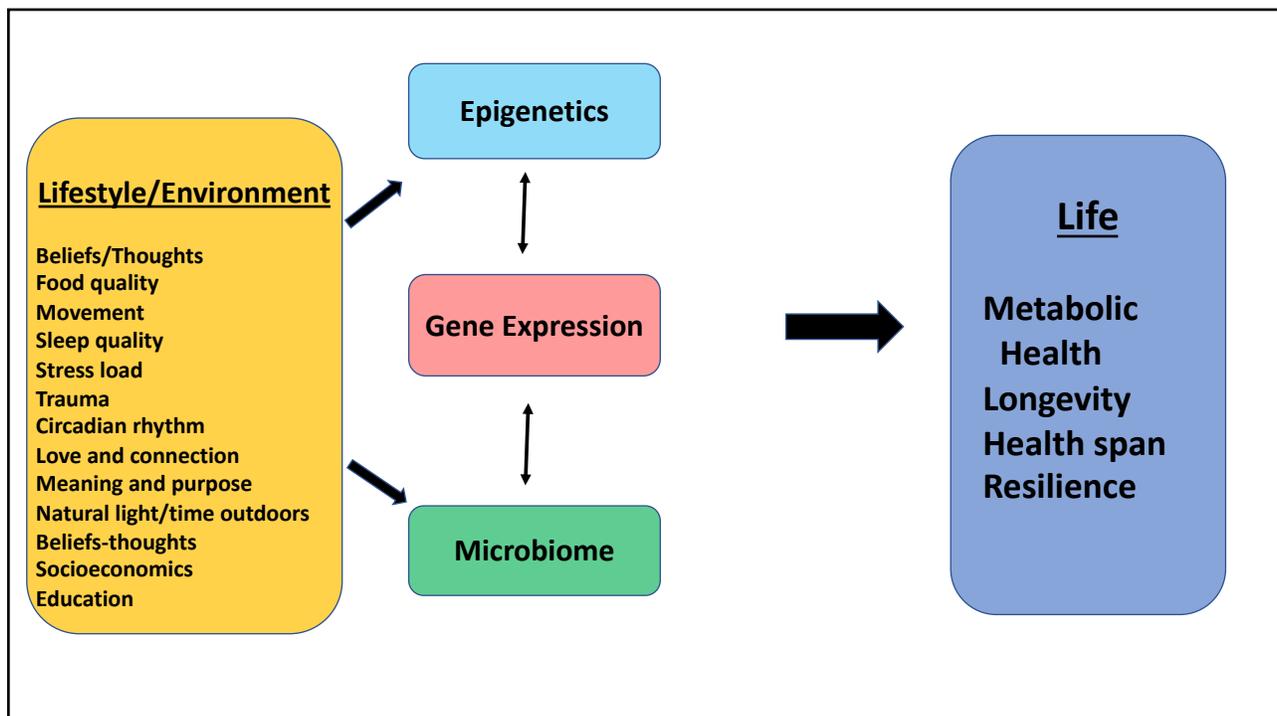- Explore lifestyle medicine strategies to create improved metabolic health

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Epigenetic Clocks and Biologic Aging

- Steven Horvath- EpiAging biologic clock: https://www.epiagingusa.com/ $169
- Elysium Index- https://www.elysiumhealth.com/ $499
- True Diagnostic- https://trudiagnostic.com/products/truage-complete-epigenetic-collection $499

Biological Age vs **Chronological Age**

○ 62

● 48

0.77 your ra...

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Lifestyle/Environment

Beliefs/Thoughts
Food quality
Movement
Sleep quality
Stress load
Trauma
Circadian rhythm
Love and connection
Meaning and purpose
Natural light/time outdoors
Beliefs-thoughts
Socioeconomics
Education

Epigenetics

Gene Expression

Microbiome

Life

Metabolic
Health
Longevity
Health span
Resilience

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Prevalence of Optimal Metabolic Health in American Adults: National Health and Nutrition Examination Survey 2009–2016

Joana Araújo, PhD,[1] Jianwen Cai, PhD,[2] and June Stevens, PhD[1,3]

- 8721 individuals
- Metabolic Health: Waist circumference < 40"; BP 120/80 or less; FBS < 100; HbA1c < 5.7; TGA/HDL ratio < 3; No Meds
- 12.2% individuals met all criteria

Disrupted metabolic health greatly accelerates aging, reduces longevity and diminishes health span.

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Prevalence of Optimal Metabolic Health in American Adults: National Health and Nutrition Examination

- 8721 individuals

Metabolic Health as defined by:
- Waist circumference < 40" in men and < 36" women
- BP 120/80 or less
- FBS < 100; HbA1c < 5.7
- TGA/HDL ratio < 3
- No Meds
- Only 12.2% individuals met all criteria

Disrupted metabolic health greatly accelerates aging, reduces longevity and diminishes health span.

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Prevailing View

Obesity occurs when a person consumes more
calories from food than he or she burns.
National Institute of Health

Overweight is the result of caloric imbalance (too
few calories expended for the amount of calories
consumed) and is mediated by genetics and health.
US Surgeon General

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Emerging View

- A calorie is not a calorie
- Macronutrients i.e., carbs, fats and protein, elicit different metabolic effects (food as information)
- Quality of macronutrients e.g. sugar and refinement of grains will substantially impact metabolic effects
- Quality of calories more important (and interesting) than quantity of calories
- Quality fat sources less harmful than thought
- Poor-quality carbs and sugar are more harmful than thought
- *Metabolic health is a two-way street, driven by environmental-epigenetic mismatch*

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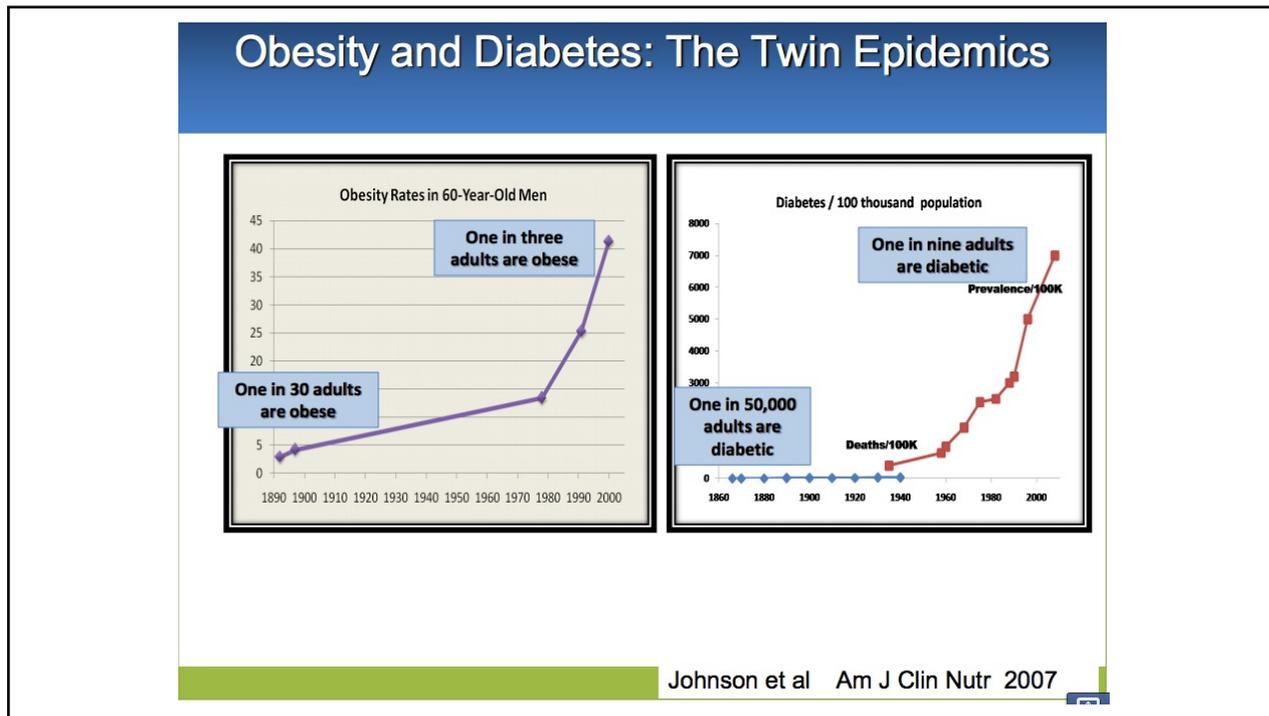
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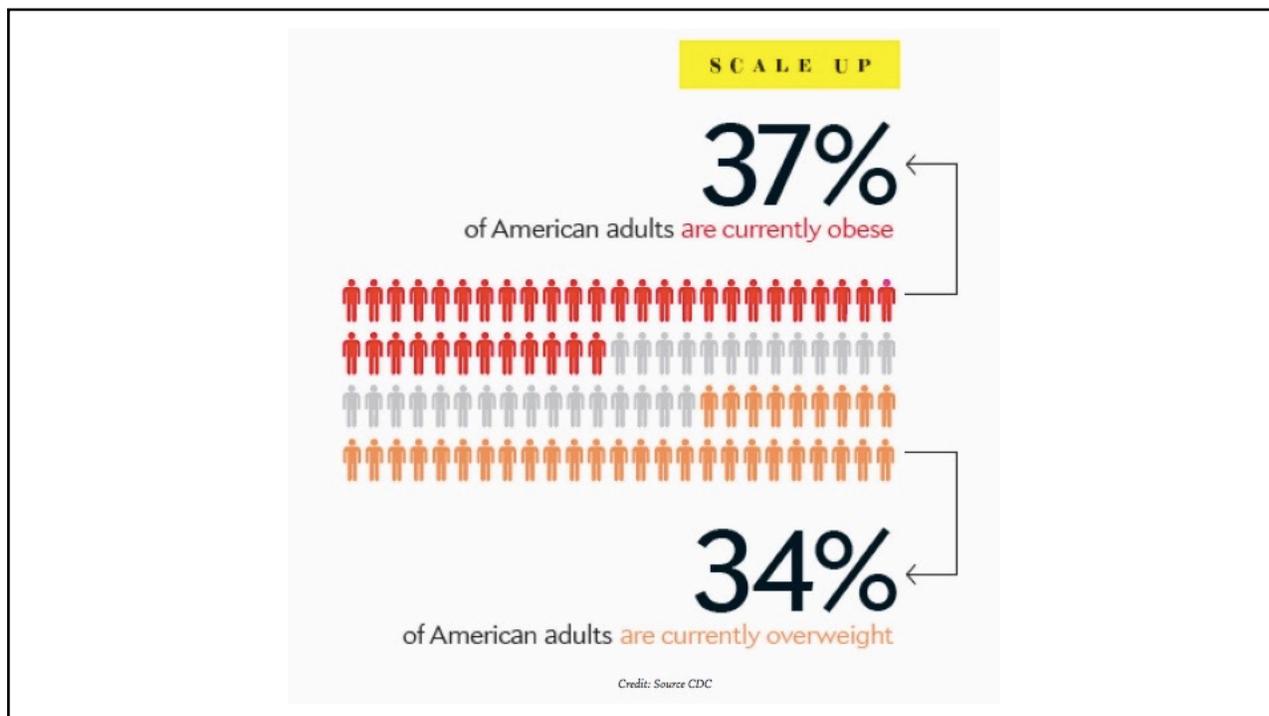
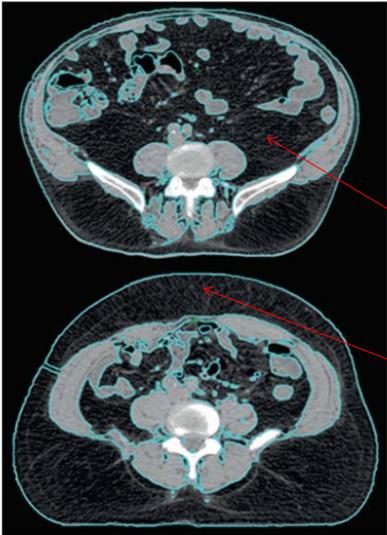12

The Tape Test

Waist to Hip Ratio
- < 0.8 in women
- < 0.9 in men

Waist to Height?

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Limitations of Weight and BMI

- BMI of limited value with higher lean body mass
- Body composition (lean body mass and fat stores)
- VAT vs. SAT
- TOFI – "thin outside, fat inside"

Most adipose is VAT

Most adipose is SAT

Same weight and waist circumference:
Different metabolic risks!

Figure 4
Computed tomography (CT) scans of two individuals with similar waist circumference (WC) but different amounts of visceral and subcutaneous fat area, illustrating the potential for misclassification when using WC as a surrogate of visceral obesity.

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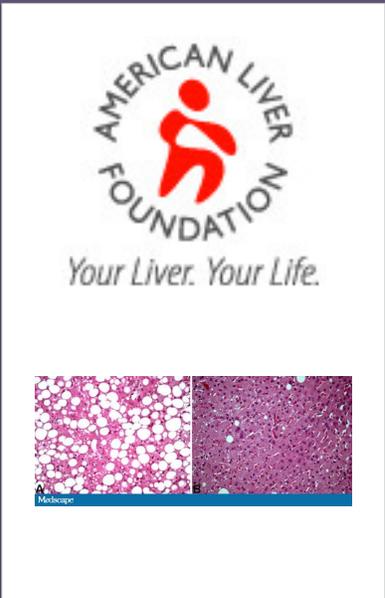
NAFLD
Non-alcohol fatty liver disease

- Has become one of the most common diseases in America from not having been described until 1980.
- 45% of all Latinos
- 33% of all Caucasians
- 25% of all African Americans
- 5% of all progress to NASH
- 25% NASH progress to cirrhosis
- Preventable

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SundayReview | OPINION

Always Hungry? Here's Why

By DAVID S. LUDWIG and MARK I. FRI...

The *New York Times* Bestseller
Always Hungry?
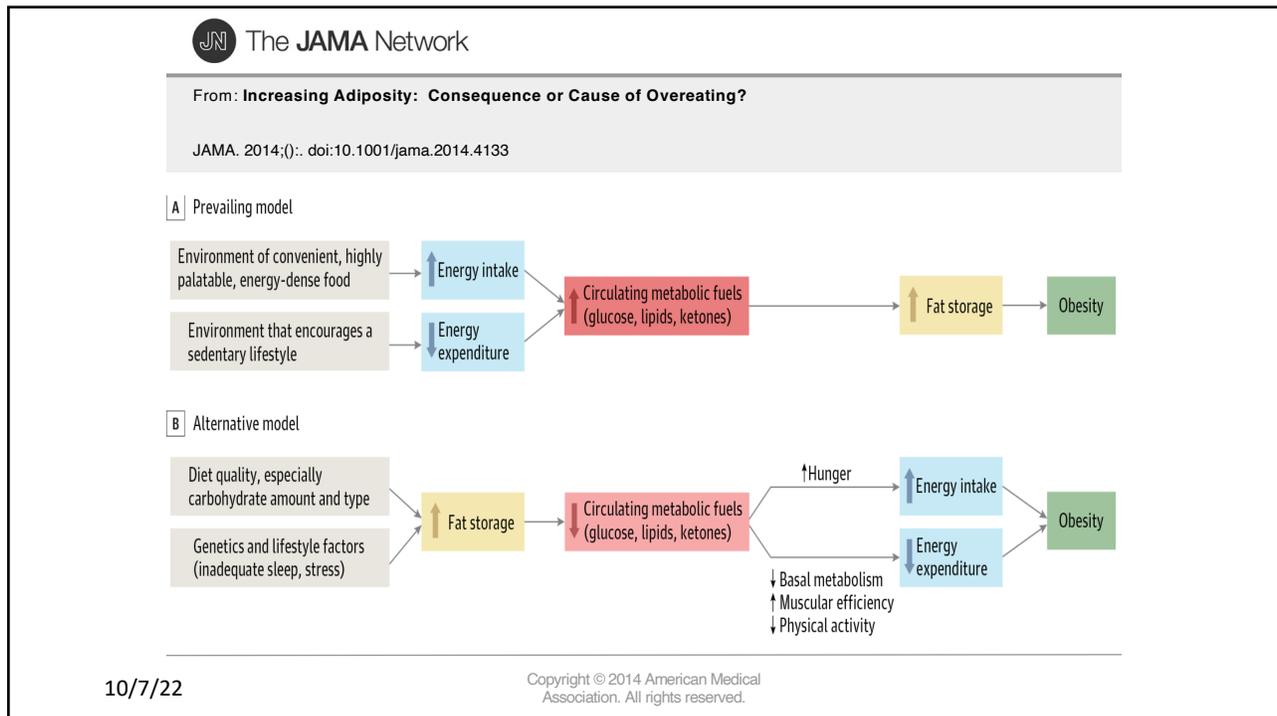Conquer Cravings,
Retrain Your Fat Cells &
Lose Weight Permanently
David Ludwig, MD, PhD

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Slide 17

The JAMA Network

From: **Increasing Adiposity:　Consequence or Cause of Overeating?**

JAMA. 2014;():. doi:10.1001/jama.2014.4133

A Prevailing model

- Environment of convenient, highly palatable, energy-dense food → ↑ Energy intake
- Environment that encourages a sedentary lifestyle → ↓ Energy expenditure

→ ↑ Circulating metabolic fuels (glucose, lipids, ketones) → ↑ Fat storage → Obesity

B Alternative model

- Diet quality, especially carbohydrate amount and type
- Genetics and lifestyle factors (inadequate sleep, stress)

→ ↑ Fat storage → ↓ Circulating metabolic fuels (glucose, lipids, ketones)

- ↑ Hunger → ↑ Energy intake → Obesity
- ↓ Basal metabolism / ↑ Muscular efficiency / ↓ Physical activity → ↓ Energy expenditure

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Slide 18

Poor Quality Carbs
Acellular carbohydrate density

↓

Excess Insulin

↓

VAT Fat storage-lipogenesis

Down-regulation of insulin receptors

↓

Insulin Resistance

↓

Leptin resistance

↓

Eat more and do less

Inflammation
- Stress
- Sleep disruption
- *Altered gut-permeability/microbiome*
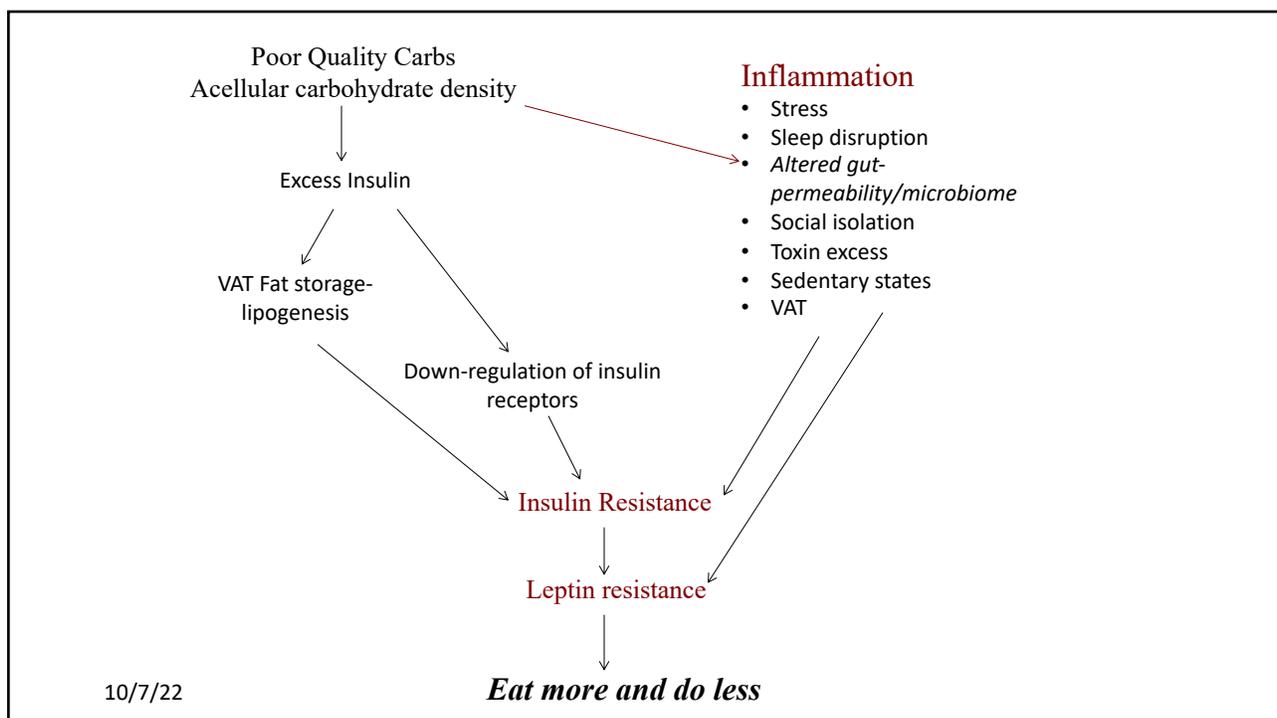- Social isolation
- Toxin excess
- Sedentary states
- VAT

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THE DIETARY CARBOHYDRATE HYPOTHESIS FOR HEART DISEASE

Hyperglycaemic Hyperinsulinaemic Inflammatory Dyslipidaemia (HHiD)

High carbohydrate (fructose) diet

↑ Glucose
↑ Insulin
↑ Triglycerides
↓ HDL-C
↑ Small LDL-C particles
↑ Uric acid*
↑ CRP
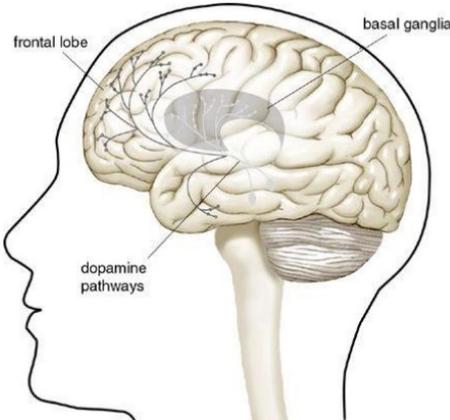Fatty liver

Low Omega 3, high Omega 6

- Arterial inflammation
- Metabolic syndrome
- Coronary heart disease/stroke
- Obesity
- Diabetes
- Hypertension

ONE CAUSE, ONE TREATMENT FOR ALL CONDITIONS

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Increased Food Intake due to Food Addiction: Simulation of Dopamine in the Brain

frontal lobe
basal ganglia
dopamine pathways

Similarities between Obesity AND Addiction

Lean   Obese

Control   Abuser

Dopamine creates a pleasure response

Dopamine D2 receptor imaging

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Five hour rule after eating a meal

- Am I hungry again within a few hours?

- Am I tired and ready for a nap?

- Does my mind feel sharp, attentive and focused?

- Am I experiencing bloating, gas, cramping?

…if the answer to any of these questions is consistently "yes" then there are significant problems with what you are eating!

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Reduce poor quality, processed, carbohydrate-dense foods

High GI Foods

All Carbs
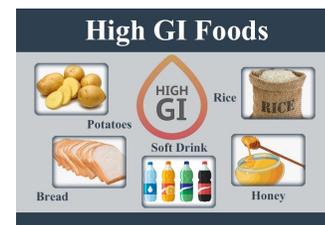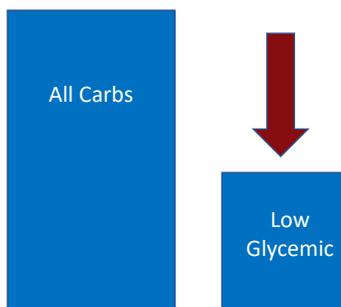
Low Glycemic

- Added Sugar
- Grain-based flour e.g. breads, cereal grains, pasta, pastries, desserts, bagels, chips, pretzels, granola bars.
- Whole grains are still high-glycemic
- Gluten-Free food options
- Dried fruits e.g. raisins, apricots, cherries
- Sweetened soft drinks
- Beer is liquid bread
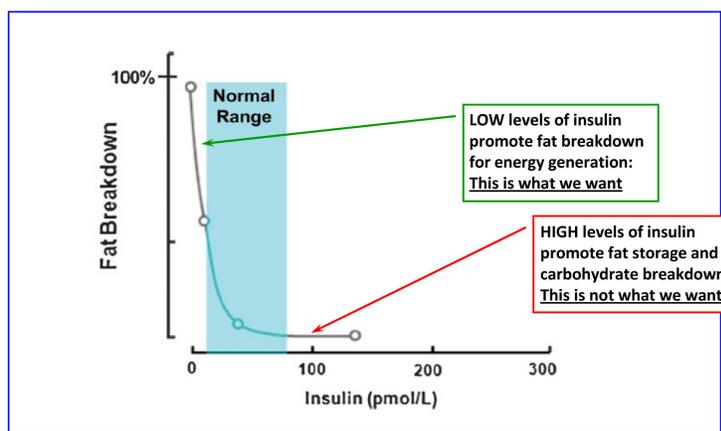- Lowered insulin and reduced inflammation "unlock" fat burning

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2. Avoid sugar and starch

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Here's what you should *not* eat on low carb – foods full of sugar and starch:

Potatoes **17**

Pasta, cooked **29**

Fruit **7 - 20**

Rice, cooked **28**

Soda / Juice **52**
(per 16 oz – 50 cl)

Chocolate bar **60**

Bread **46**

Less carbs

More carbs

Beer **13**
(per 12 oz – 33 cl)

Donut **49**

Candy **70**

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www.dietdoctor.com

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Lipolysis vs. Lipogenesis

LOW levels of insulin promote fat breakdown for energy generation: This is what we want

HIGH levels of insulin promote fat storage and carbohydrate breakdown: This is not what we want

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USDA National Nutrient Database. The amount of sugar is higher in the low-fat and fat free foods compared to "regular" full-fat foods. P=0.00001

OPEN

Citation: Nutrition & Diabetes (2016) **6**, e193; doi:10.1038/nutd.2015.43
www.nature.com/nutd

SHORT COMMUNICATION

A systematic comparison of sugar content in low-fat vs regular versions of food

PK Nguyen[1,2], S Lin[2] and P Heidenreich[1,2]

Obesity remains a significant public health concern. One of the primary messages from providers and health-care organizations is to eat healthier foods with lower fat. Many in the lay press, however, have suggested that lower fat versions of foods contain more sugar. To our knowledge, a systematic comparison of the sugar content in food with lower fat alternatives has not been performed. In this study, we compared fat free, low fat and regular versions of the same foods using data collected from the USDA National Nutrient Database. We found that the amount of sugar is higher in the low fat (that is, reduced calorie, light, low fat) and non-fat than 'regular' versions of tested items (Friedman $P = 0.00001$, Wilcoxon $P = 0.0002$ for low fat vs regular food and $P = 0.0003$ for non-fat vs regular food). Our data support the general belief that food that is lower in fat may contain more sugar.

Nutrition & Diabetes (2016) **6**, e193; doi:10.1038/nutd.2015.43; published online 25 January 2016

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More quality fat sources

- Pasture-raised eggs
- Fatty fish e.g. salmon, sardines, mackerel
- Grass-fed butter
- Ghee
- Pasture-raised meats
- Shellfish
- Whole fat yogurt, kefir
- Extra virgin olive oil
- Extra virgin coconut oil
- Avocados, olives
- Nuts - almonds, macadamia, walnuts

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A calorie is not a calorie…

- **Effects of Dietary Composition on Energy Expenditure During Weight-Loss Maintenance**
- Cara B. Ebbeling, PhD; David S. Ludwig, MD, PhD et al

- **Conclusion:** Among overweight and obese young adults compared with pre–weight-loss energy expenditure, isocaloric feeding following 10% to 15% weight loss resulted in decreases in REE and TEE that were greatest with the low-fat diet, intermediate with the low–glycemic index diet, and least with the very low-carbohydrate diet.

- Remarkable range between individuals
- TEE: - 423 [–606 to –239] kcal/d for low fat diet
-         - 57 [–281 to 86] kcal/d for low carb diet
- Equivalent of 1-hr moderate effort cardio difference

JAMA. 2012;307(24):2627-2634. doi:10.1001/jama.2012.6607

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"About 75% off the food in the Western diet is of limited or no benefit to the microbiota in the lower gut. Most of it, comprised specifically of refined carbohydrates, is already absorbed in the upper part of the GI tract, and what eventually reaches the large intestine is of limited value, as it contains only small amounts of the minerals, vitamins and other nutrients necessary for maintenance of the microbiota"
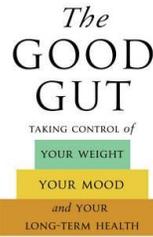
– Nutrients 2013, 5, 162-207; doi: 10.3390/nu5010162

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Starving our Microbial Self:
The Deleterious Consequences of a Diet Deficient in Microbiota-Accessible Carbohydrates

Erica D. Sonnenburg[1] and Justin L. Sonnenburg[1,*]
[1]Department of Microbiology and Immunology, Stanford University School of Medicin   A 94305, USA
*Correspondence: jsonnenburg@stanford.edu
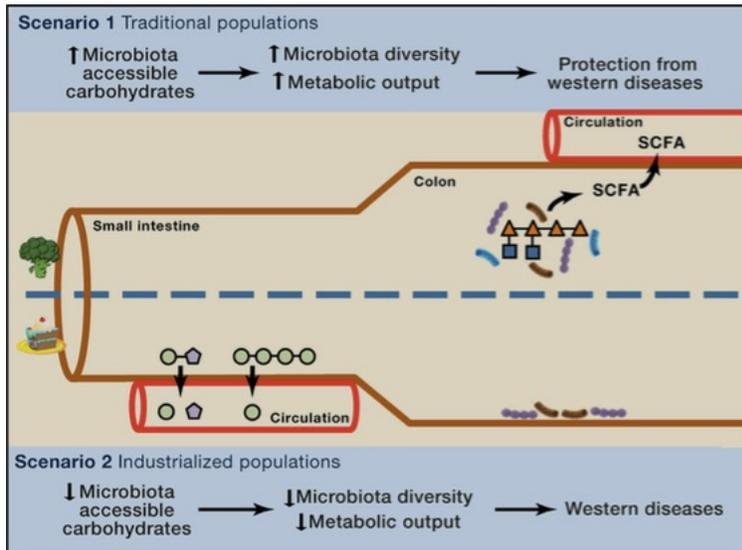http://dx.doi.org/10.1016/j.cmet.2014.07.003

The gut microbiota of a healthy person may not be equivalent to a   ssible that the Western microbiota is actually dysbiotic and predisposes individ   es. The asym-metric plasticity between the relatively stable human genome and   crobiome sug-gests that incompatibilities between the two could rapidly arise. Th   includes a diet low in microbiota-accessible carbohydrates (MACs), has selected   d membership and functionality compared to those of groups living traditional   ween resident microbes and host leading to immune dysregulation may explain   e inflammation as a common basis. The low-MAC Western diet results in poor   iota-generated short-chain fatty acids (SCFAs), which attenuate inflammation thr   isms in mouse models. Studies focused on modern and traditional societies, co   ls, are needed to characterize the connection between diet, microbiota compositi   iating between an optimal microbiota, one that increases disease risk, and one th   es disease will be required to further understand both the etiology and possible treatments for health problems related to microbiota dysbiosis.

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Scenario 1 Traditional populations
↑ Microbiota accessible carbohydrates → ↑ Microbiota diversity ↑ Metabolic output → Protection from western diseases

Scenario 2 Industrialized populations
↓ Microbiota accessible carbohydrates → ↓ Microbiota diversity ↓ Metabolic output → Western diseases

Cell Metabolism 20, November 4, 2014 ©2014 Elsevier Inc.

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Cell Metabolism 20, November 4, 2014 ©2014 Elsevier Inc.
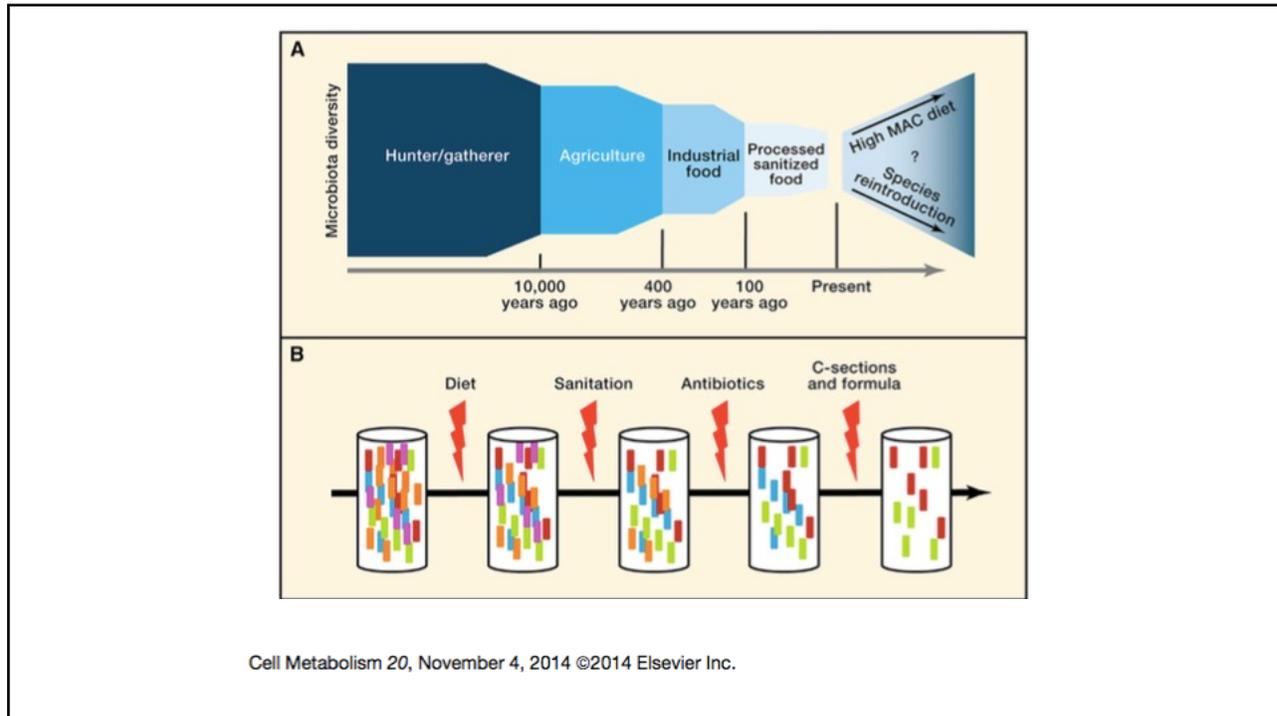
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Plant-based foods

- Fill half of plate with vegetables
- 2 cups greens/day is a nice goal
- Cruciferous e.g. broccoli, cauliflower, collards, cabbage, kale, spinach, asparagus, romaine lettuce, arugula
- Allium family e.g. onions, leeks, garlic
- Beans and lentils; soaking and pressure cooking can be easier on the gut, reducing lectins
- Lower glycemic fruits e.g. berries, grapefruit, kiwi
- Anti-inflammatory spices e.g. turmeric, basil, ginger, rosemary, cayenne pepper
- Fermentable Fiber essential for gut biome diversity
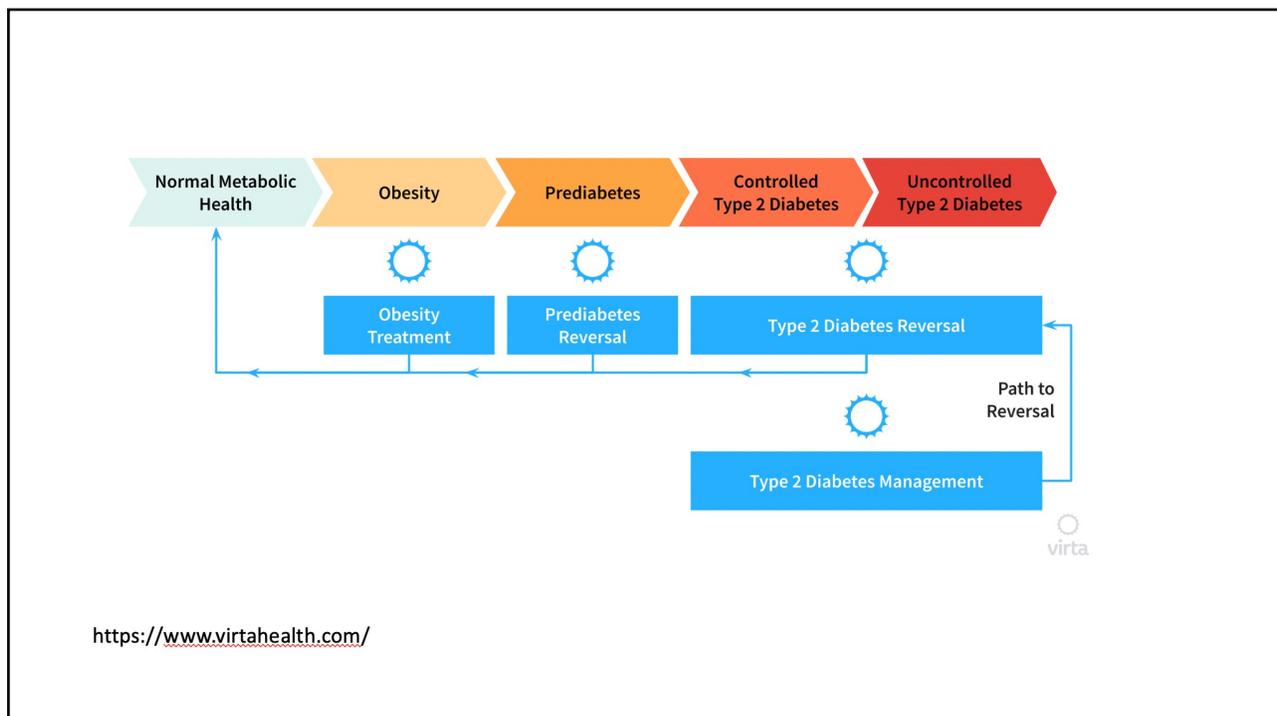- Fermentable foods e.g. yogurt, sauerkraut

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https://www.virtahealth.com/

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Median American Eating Patterns vs. **Early Time-Restricted Feeding**

- Postprandial Insulin ↓
- Insulin Sensitivity ↑
- β-Cell Function ↑
- Fasting Triglycerides ↑
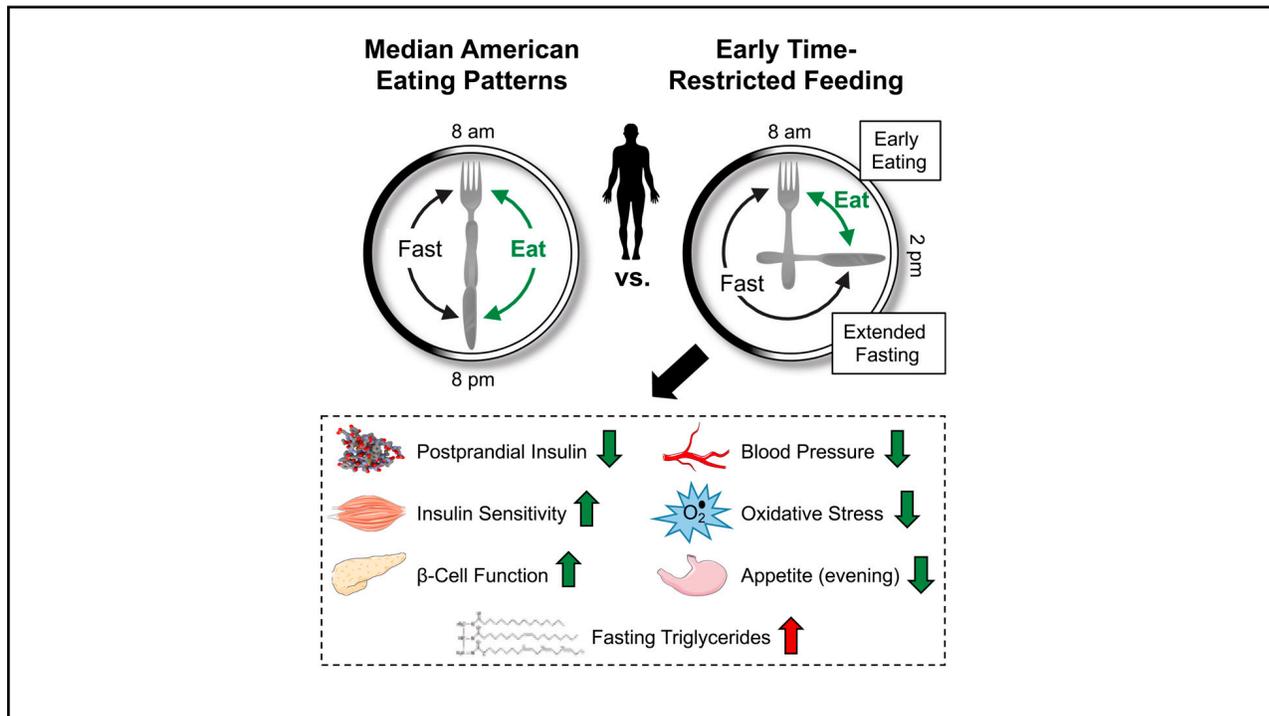- Blood Pressure ↓
- Oxidative Stress ↓
- Appetite (evening) ↓

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Know your numbers!

- Fasting Blood Sugar (< 100)
- HOMA IR a test of Insulin Resistance (< 1ideal)
- Uric acid (< 5.5 ideal)
- Hemoglobin A1c, less than 5.7 ideal
- LDL particle #, cardiovascular risk
- ApoB, cardiovascular risk
- Vitamin D, want to be > 30
- hsCRP, a measure of inflammation; < 1 is ideal
- Triglycerides < 150, lower is ideal
- Triglyceride/HDL ratio <2 ideal
- Total and free testosterone levels (want to be at-above 25th-50th percentile

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Reclaiming and Maintaining ore Metabolic Health and Flexibility
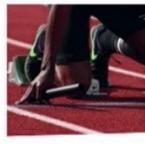
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Thank you!

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Summary: Enhancing metabolic efficiency:
…. Reduce inflammation, insulin and leptin resistance

- Eliminate – reduce sugar in all it's forms
- Eliminate-reduce refined grain flours, and carbohydrate-dense processed foods. Try going wheat-free for a month.
- Reduce hydrogenated oils and processed seed oils cooked at high temperatures
- OK to consume pasture-raised meats and eggs
- More abundant healthy fats sources e.g. extra virgin olive oil, fatty fish, grass-fed butter; eggs; extra virgin coconut oil (MCT Oil); pasture-raised animal fat, ghee, avocados, nuts (almonds, walnuts and macadamia) and nut butters
- Plant-based foods with a lot of fiber and nutrient density

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