

Fiber and Gut Microbiome



Question

- What is the most prevalent nutrient deficiency in American diet?
- A. Vitamin B12
 - B. Iron
 - C. Fiber
 - D. Protein

Answer

FIBER

97 % of American DO NOT get minimal daily requirement of fiber

We are 'Fiber Deficient' population

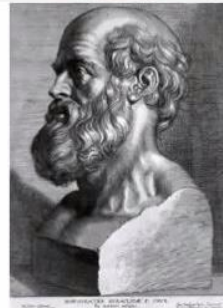
The average American adult eats 10-15 grams of fiber which is less than half the daily requirement.

Our Microbiota and Us

Factors influencing the microbiota

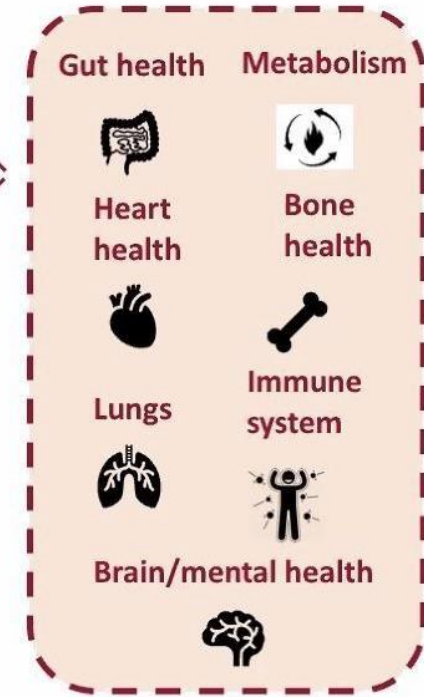


Microbiota



"All diseases begin in the gut"
Hippocrates (c. 460 – c. 370 BC)

The microbiota and our health



Our gut

- The path to overall health and wellness is through our gut
- We have 39 trillion microorganisms in our colon
- we are only 10% human and 90% bacteria.
- The human microbiome is composed of bacteria, archaea, viruses, and eukaryotic microbes that reside in and on our bodies.
- They have tremendous potential to impact our body, both health and in disease
- They protect us against pathogens, help our immune system, and, through these basic functions, control our overall health.

Loss of harmony

obesity

type 2
diabetes

coronary
artery
disease

fatty liver

autoimmune
diseases

hyperlipidemia

hypothyroidism

PCOS

infertility

Depression
and anxiety

variety of
cancers

Where Do you get your fiber from?

- 97% of us eat an excess of protein every day
- When it comes to our gut health, *where* we get our protein from matters
- Fiber-rich plant protein promotes the growth of healthy gut bacteria
- Fiber deficient animal protein promotes the growth of inflammatory gut bacteria
- Unhealthy bacteria produce toxins like amines, sulfides, secondary bile salts, and TMAO
- These toxins are associated with food sensitivity, colitis, and many gastrointestinal cancers.

A collage of various processed and refined foods including bread, cheese, salami, french fries, and fried chicken. The background is a dark, textured green.

Root of the Problem

Our toxic SAD "Standard American Diet" is made up of refined and processed food, animal-based products with saturated fats, cholesterol, added sugar and sweetener, excessive protein and very little plant-based food.

Low/No Fiber Foods



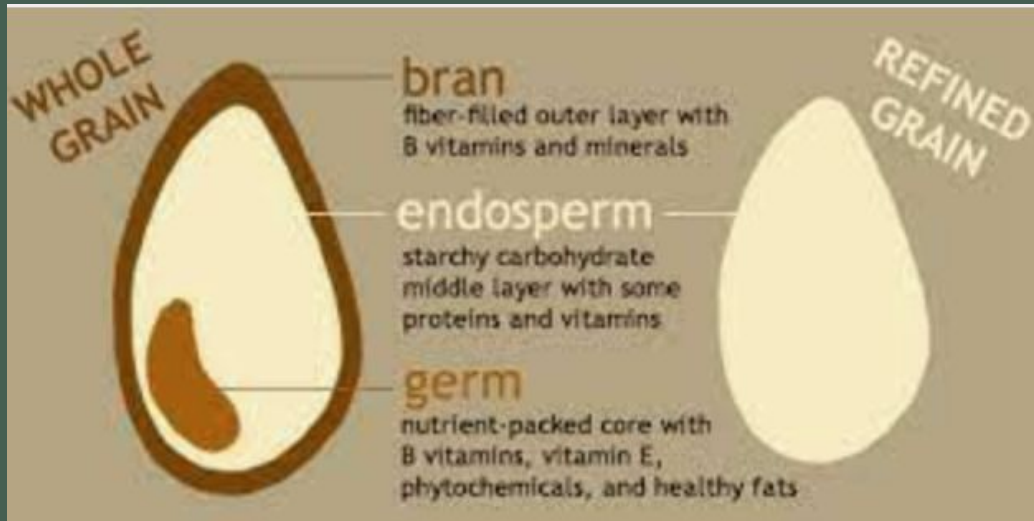
LOW FIBER FOODS

- Refined carbohydrates
- Fast foods, highly processed foods

NO FIBER FOODS

- Meat, poultry, fish, eggs
- Dairy products
- Fat, oil, sugar

LOSS of FRBER : Refining Grain



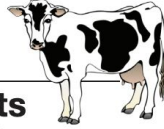
•Typical losses:

- 80-90 % of fiber
- 70-80% of the vitamins and minerals
- 95% of the phytochemicals

Animal protein vs plant protein

Steak

Trimmed to 1/8" fat, baked



Nutrition Facts

Serving Size 100g (½ cup)

Amount per serving

Calories 189 **Calories from Fat** 100

% Daily Value

Total Fat 11g **17%**

Saturated fat 4g **22%**

Cholesterol 41mg **14%**

Sodium 53mg 2%

Total Carbohydrate 0g 0%

Dietary Fiber 0g **0%**

Protein 21g

Nutrition facts from www.NutritionData.com.

Beans

Black, boiled



Nutrition Facts

Serving Size 100g (½ cup)

Amount per serving

Calories 132 **Calories from Fat** 5

% Daily Value

Total Fat 1g 1%

Saturated fat 0g 1%

Cholesterol 0mg **0%**

Sodium 1mg 0%

Total Carbohydrate 24g 8%

Dietary Fiber 9g **35%**

Protein 9g

Cholesterol is only found in **animal-based foods**. These foods are also our main source of **saturated fat**, which our bodies can turn into cholesterol. **Fiber** helps to lower our cholesterol and is only found in **plant-based foods**.

How much protein does the average person need each day?

Multiple your body weight (kg) by 0.66 to calculate your **Estimated Average Requirement (EAR)**.

	125 lb	175 lb	225 lb	275 lb
Estimated Average Requirement (EAR)	38 g	52 g	67 g	82 g
Average intake by U.S. adults	68-86 g	96-120 g	122-153 g	150-187 g

Trimethylamine N-oxide (TMAO)

- Increased levels of TMAO from heavy consumption of animal protein, egg yolk, and dairy products
- Increase the risk of heart disease, stroke, Alzheimer's disease, type 2 diabetes, congestive heart failure, and atrial fibrillation
- Plant-based diet promotes gut bacteria that do not know how to make TMAO

FIBER AND COLON CANCER PREVENTION

- Good gut bacteria converts fiber into SCFA's like BUTYRATE.
- Butyrate: stops colon cancer cell growth.
- However, without butyrate leads to colon cancer cell growth.
- Ideally, we have to eat a lot of fiber rich food—meaning whole plant foods - every day.
- If we take care of them; they take care of us

WHAT IS RESISTANT STARCH?

Any starch that is not digested in the upper digestive tract and passes to the large bowel(colon)

Boil starch, some starch crystallizes and is resistant to the digestive enzymes

Resistant starches: cooled starches like potato salad, pasta salad or cold corn meal porridge.

Indeed, countries where people eat the most starch have some of the lowest rates of colon cancer.

WHO's IARC Guidelines

- IARC- International Agency for Research on Cancer included twenty-two experts from 10 countries reviewed more than 800 studies and concluded:
- Processed meat is "carcinogenic to humans" Group 1 (in the same Group as tobacco causing lung cancer)
- Red meat is "probably carcinogenic to humans" -Group 2A.
- Eating 50 grams (4strips of bacon or 1 hot dog) of processed meat every day increased the risk of colorectal cancer by 18%.
- Processed meat: meat that has been transformed through salting, curing, fermentation, smoking includes ham, sausage, pepperoni, hotdog, bacon and deli meats including roast beef and turkey

Carcinogens in meat!!

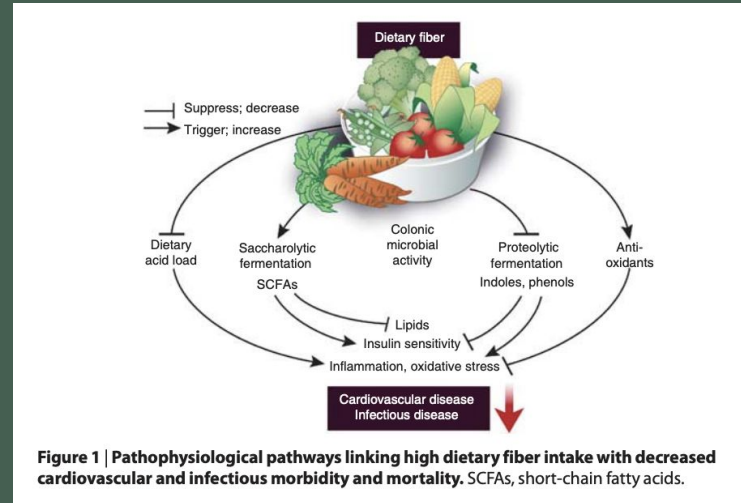
- Africans enjoy two-fold protection from cancer: diet high in resistant starch and low in animal products.
- Meat: carcinogens - N-nitroso compounds.
- Study: three groups 1.Low meat diet 2.High meat diet and 3.High meat diet with lots of resistant starch.
- High meat groups had 3X more carcinogens in their stool than low meat group and adding resistant starch didn't help!
- This may explain higher incidence of colon cancer in meat eating populations.

Fiber and chronic Kidney disease

Each **5 gram/day increase in fiber** was associated with **11% decrease in CKD incidence**

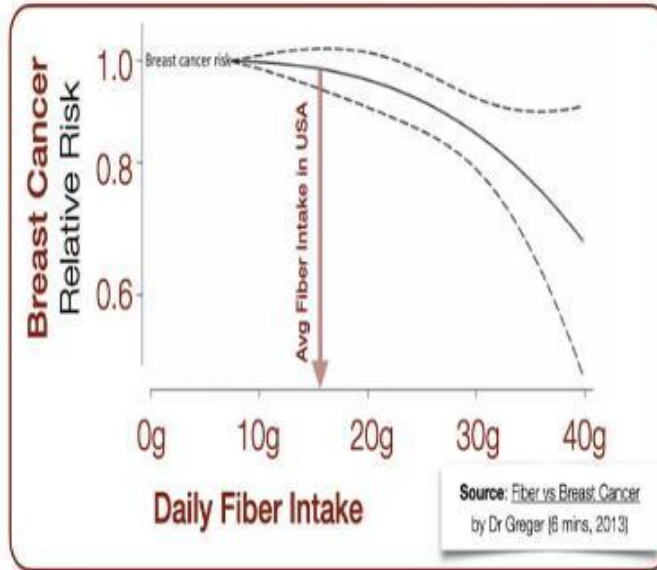
Highest fiber intake, (33.5g/day) vs lowest fiber intake (13.5g/day) was associated with **53% decrease in CKD incidence**

Increased fiber intake shifts the gut microbiota towards **reduced production of uremic toxins**



Dietary Fiber and Breast Cancer

Non-Linear Dose Response!



✓ Can we eat >80g fiber daily? Yes!

✓ Whole Foods, Plant-Based (WFPB)

✗ Animal products have zero fiber.

✗ Processed foods are often low in fiber.



•Where is the most serotonin produced in our body?

•Liver

•Brain

•Gut

Did you know?

almost 90%



of the feel good hormone
SEROTONIN is produced in the
GUT

Whole Plants



Microbiome produces butyrate

Epigenetic regulation of gene expression:

Effects on insulin resistance and obesity-PGC-1 \uparrow

Anti-inflammatory effect- NF- κ B \downarrow , inhibit mTOR

Cancer- reduce expression of VEGF

Effect on cardiovascular disease-down regulate 9 genes
intestinal cholesterol biosynthesis. G-1 cell cycle proteins

Neuroprotective –upregulates BDNF

Immune system-induces macrophage differentiation
potent antimicrobial function

Stem cell activation

Polyphenols downregulate inflammatory cascade



Butyrate



Impacts 400 genes inflammatory



Dysbiosis Fuels Insulin Resistance and Diabetes

Key mechanisms of action include:

- Increased gut permeability
- Increased production of pro-inflammatory cytokines
- Metabolic endotoxemia



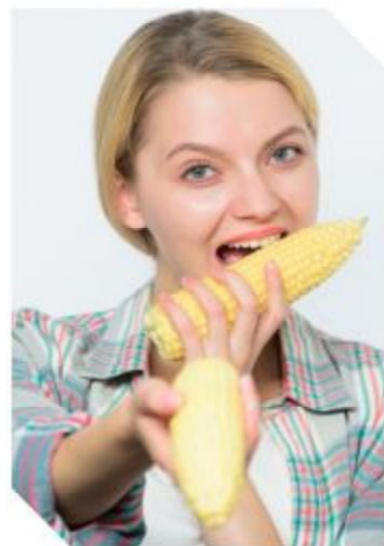
To Improve Gut Flora

- ▶ Eat more prebiotics – fiber from whole plant foods.
- ▶ Eat food-based probiotics such as non-dairy yogurts, fermented vegetables, sauerkraut, tempeh and miso.
- ▶ Minimize intake of foods associated with dysbiosis – processed and fried foods, refined CHO and meat.
- ▶ Avoid artificial sweeteners.
- ▶ Avoid excessive alcohol consumption.



Strong, Consistent Evidence

- ▶ High dietary fiber intake (>25 g/d in women and >38 g/d in men) is associated with a 20-30% reduced risk of developing type 2 diabetes (T2D).
- ▶ One meta-analysis of 17 studies reported a 6% decrease in diabetes risk for every 2 grams of fiber consumed.



Weickert MO, Pfeiffer AFH. *J Nutr.* 2018;148(1):7-12.

Yao B et al. *Eur J Epidemiology.* 2014;29(2):79-88.

Sources of Fiber

NONVISCIOUS FIBER →

Reduces diabetes risk

- ▶ Wheat and other grains



- ▶ Lentils, beans



- ▶ Corn, mushrooms, pumpkin



- ▶ Apples, bananas, berries, dates, pears



- ▶ Nuts, seeds



VISCOUS FIBER →

Improves glycemic control

- ▶ Beans



- ▶ Barley, oats



- ▶ Flaxseeds



- ▶ Avocado, citrus fruits, figs, passion fruit, plums

- ▶ Beets, Brussels sprouts, dark greens, kohlrabi, parsnips, peas



Fiber in Foods

FOOD	FIBER (g)
Legumes, 1 cup cooked	10-20
Avocado, 1 x 200 g fruit	13.5
Grains, most, 1 cup cooked	5-10
Berries, most, 1 cup	3-8
Vegetables and fruit, most, 1 cup raw	2-5
Nuts and seeds, ¼ cup	2-5

Source: USDA Nutrient Database 27


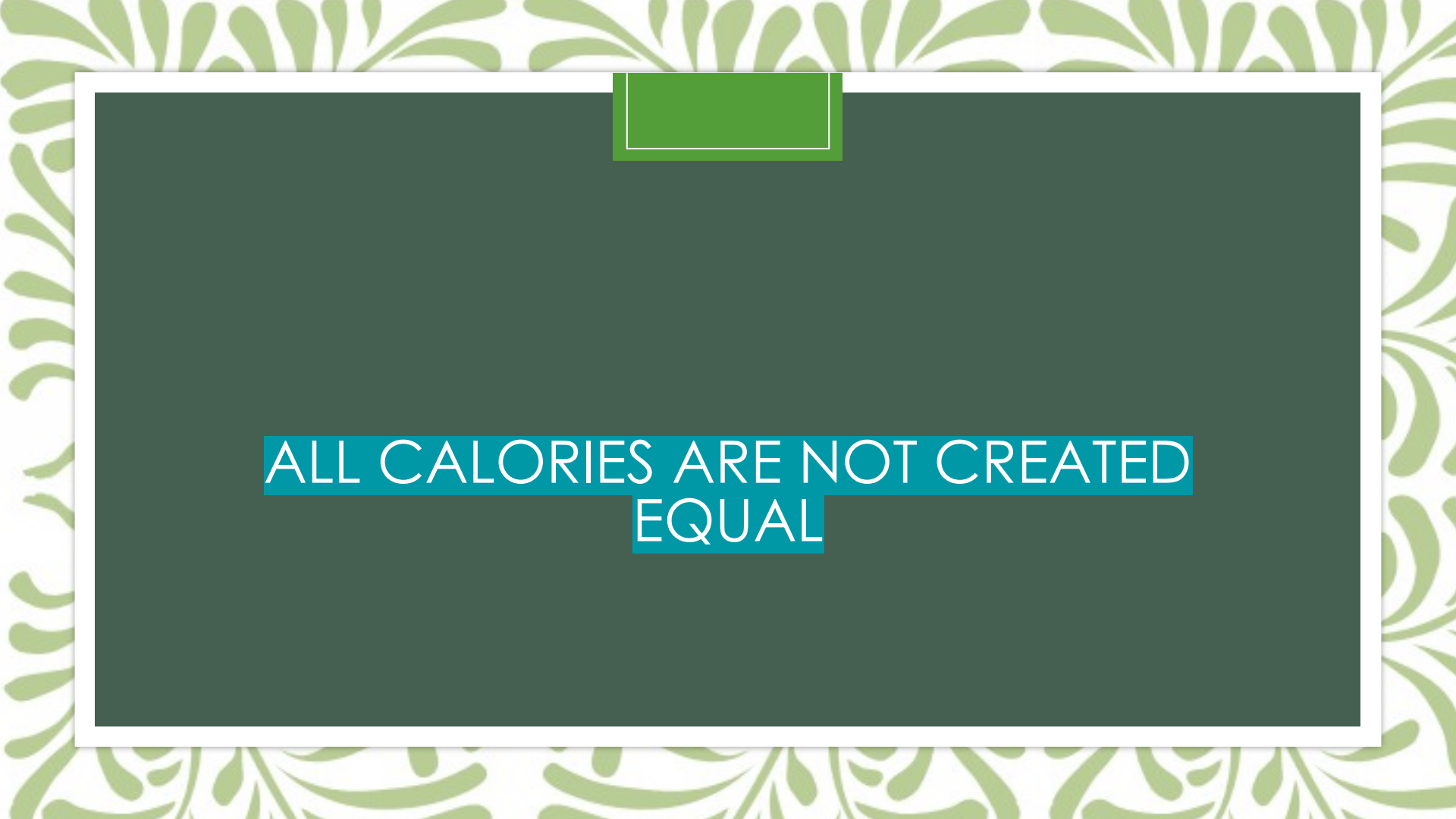
ONLY PLANT FOODS CONTAIN FIBER!





Eat More Raw Foods

- More concentrated phytochemicals
- Retain phytochemicals that may be lost in cooking
- Enzymes in raw cruciferous vegetables- (broccoli, arugula, brussels sprouts, cauliflower, kale and radish) help convert phytochemicals into their bioactive metabolites
- Allium vegetables: Garlic, shallots, leeks and scallions
- Start sprouting : phytochemicals can be 4-5 to 50 times higher in sprouts than mature plants.



ALL CALORIES ARE NOT CREATED
EQUAL

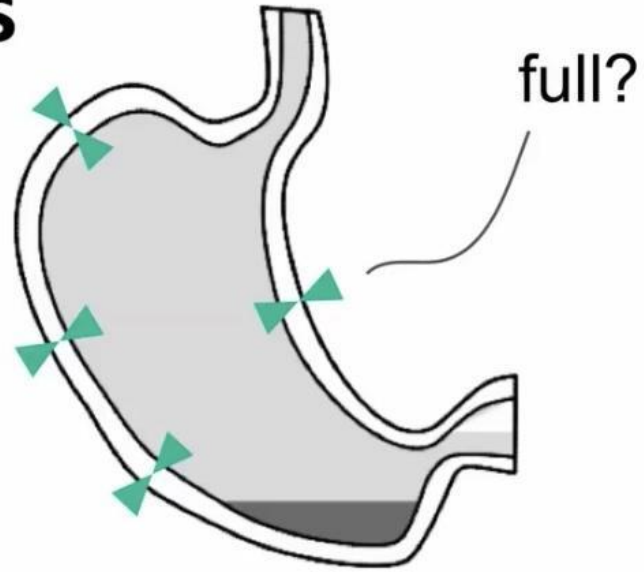


140 calories

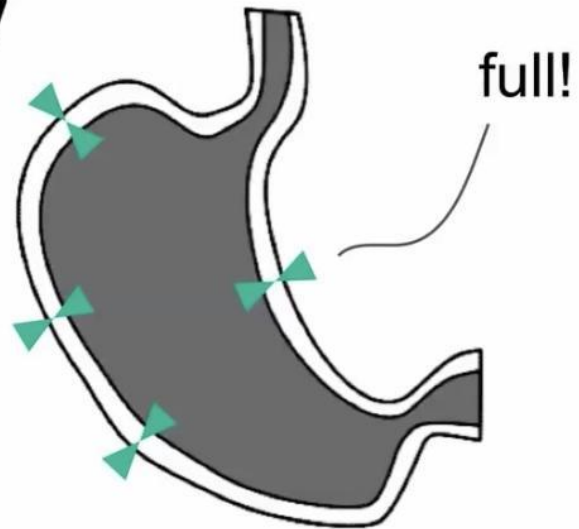


95 calories

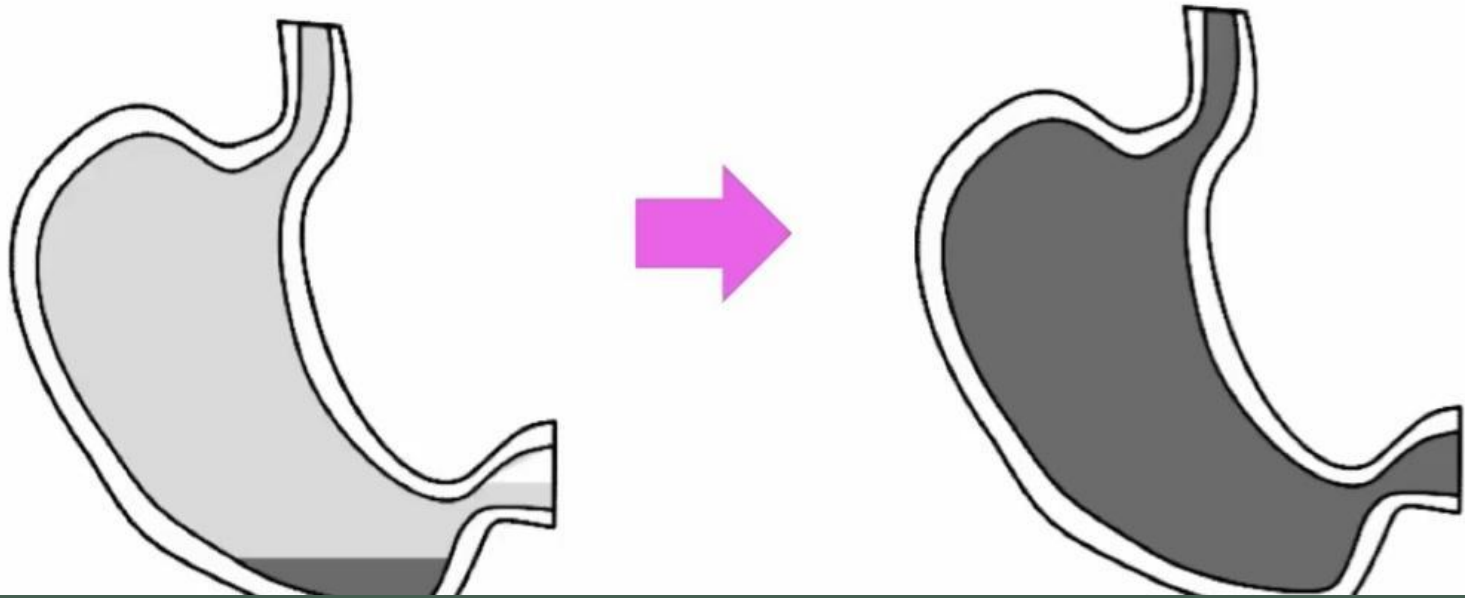
Stretch receptors



3-5 pounds a day



How to go **from empty to full** without consuming too many calories?



**Fiber keeps
you full longer
with 0 calories**



CALORIE DENSITY WHAT 500 CALORIES LOOK LIKE

OIL



CHEESE



MEAT



POTATOES,
RICE, BEANS



FRUITS &
VEGGIES



...and why whole plant-based foods will help keep you lean and satisfied.

forksoverknives.com

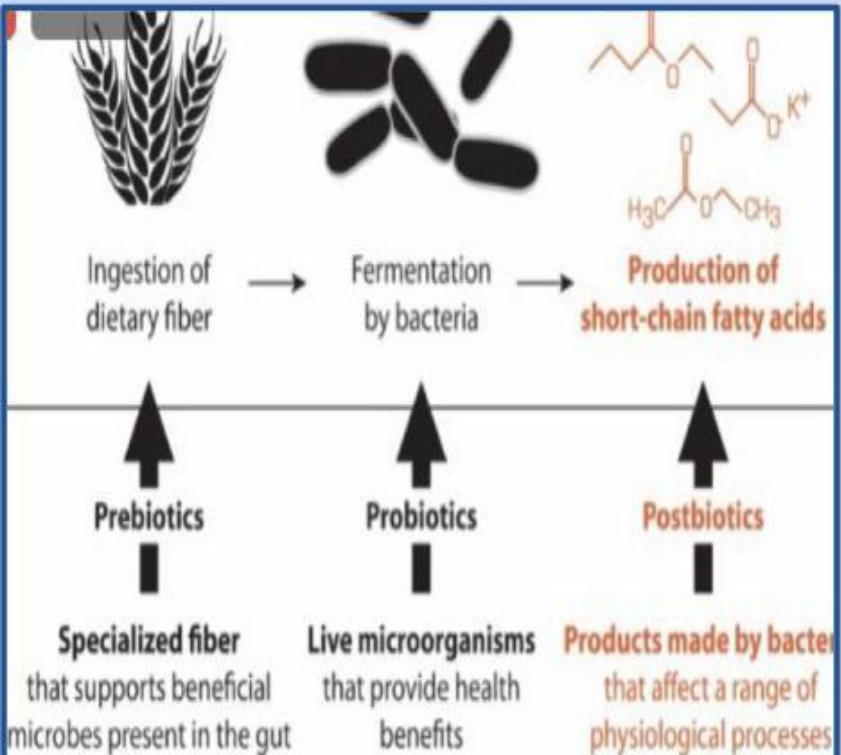
Nutrient Composition of Plant and Animal Based Foods (per 500 calories of energy)

Nutrient	* Plant-Based Foods	**Animal Based Foods
Cholesterol (mg)	---	137
Fat (g)	4	36
Protein (g)	33	34
Beta-carotene (mcg)	29,919	17
Dietary Fiber (g)	31	--
Vitamin C (mg)	293	4
Folate (mcg)	1168	19
Vitamin E (mg_ATE)	11	0.5
Iron (mg)	20	2
Magnesium (mg)	548	51
Calcium (mg)	545	252

* Equal parts of tomatoes, spinach, lima beans, peas, and potatoes.

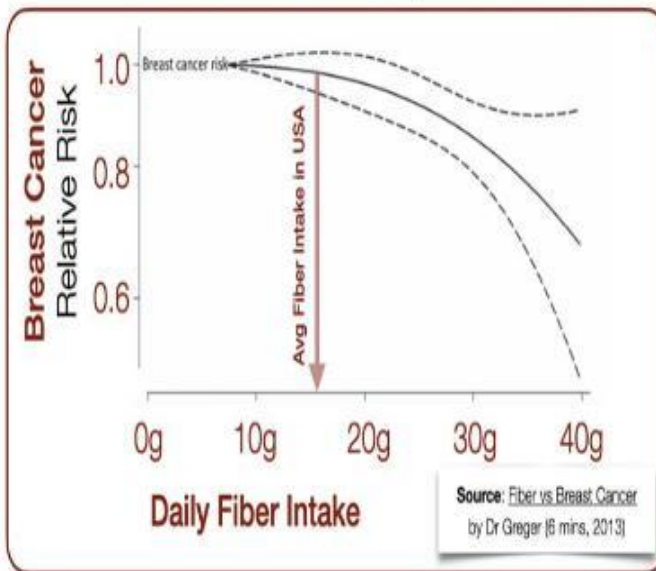
** Equal parts of beef, pork, chicken, whole milk

Fiber is a Superfood



Dietary Fiber and Breast Cancer

Non-Linear Dose Response!



Apple vs. Fruit

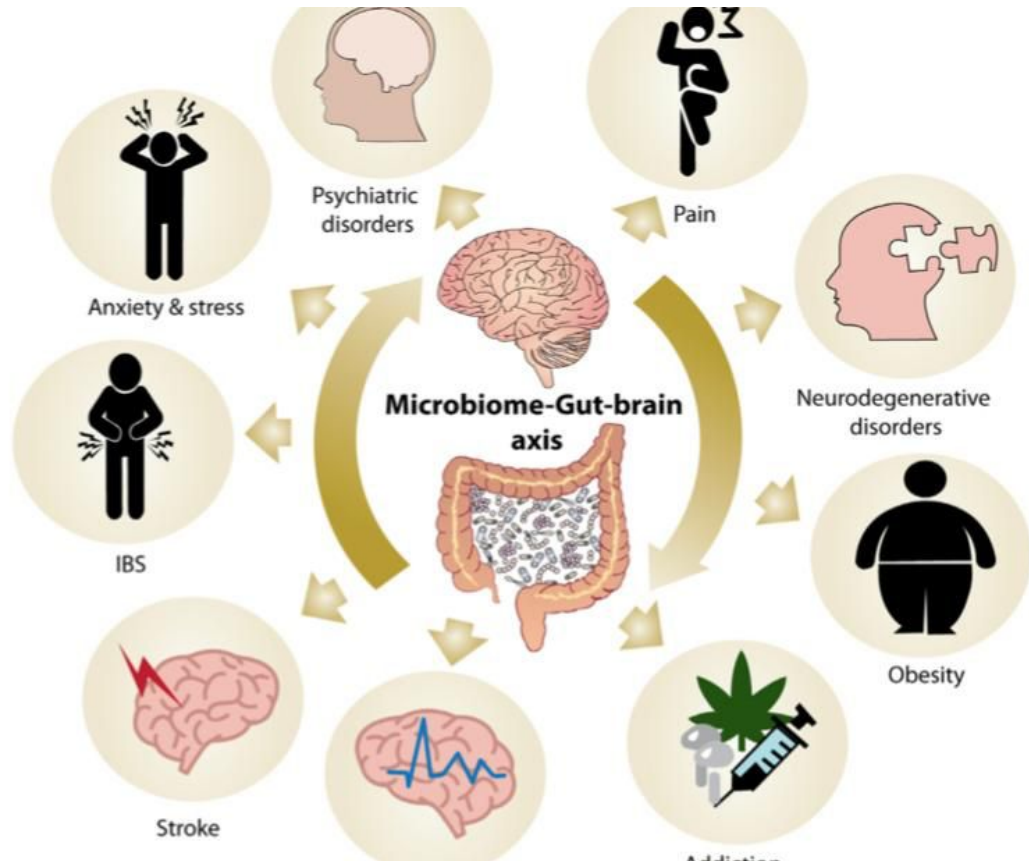


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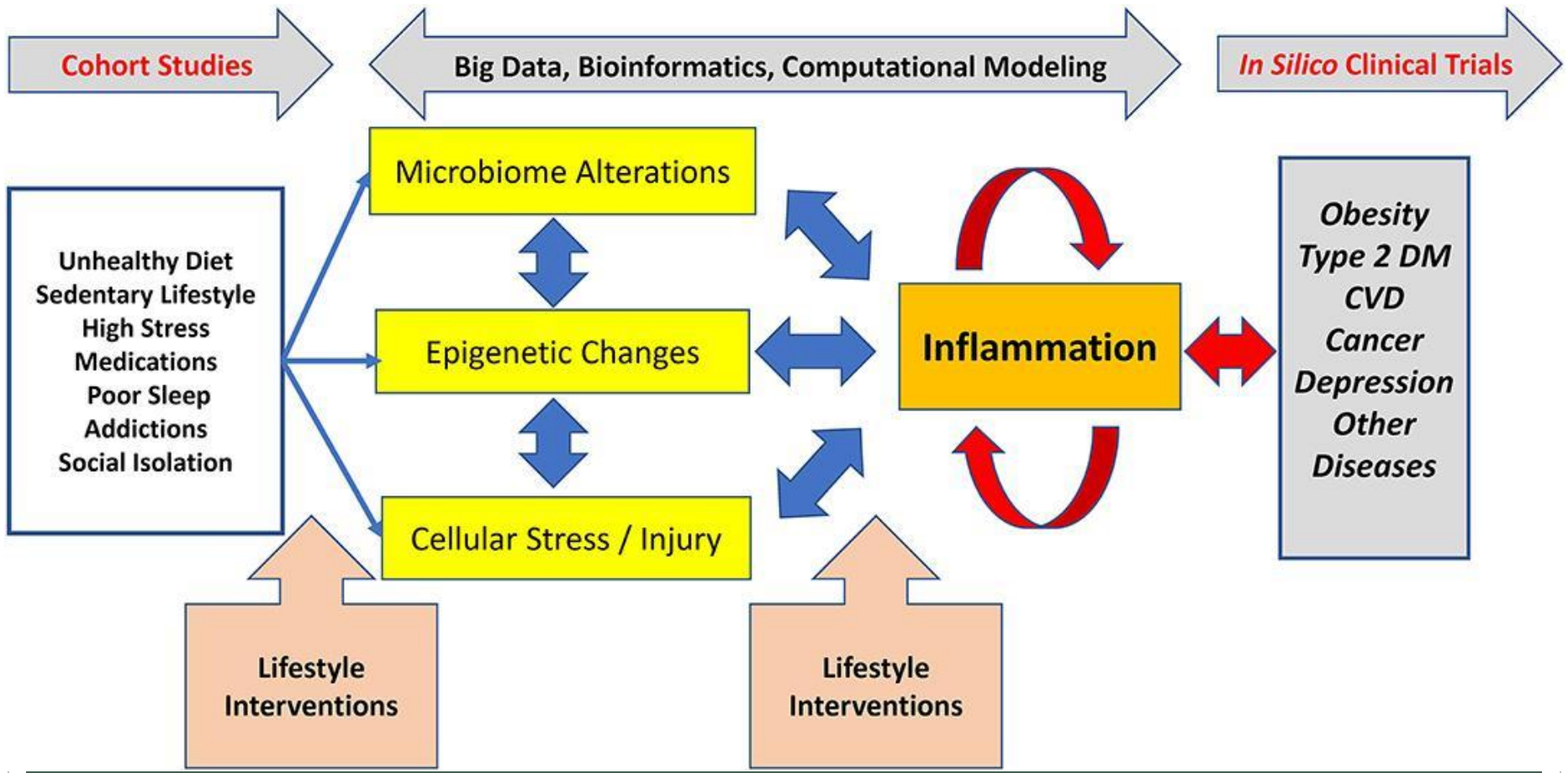
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•The Microbiota-Gut-Brain Axis John F Cryan et al. Physiol Rev. 2019.



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