



Food Is Medicine

Evidence-Based Nutrition

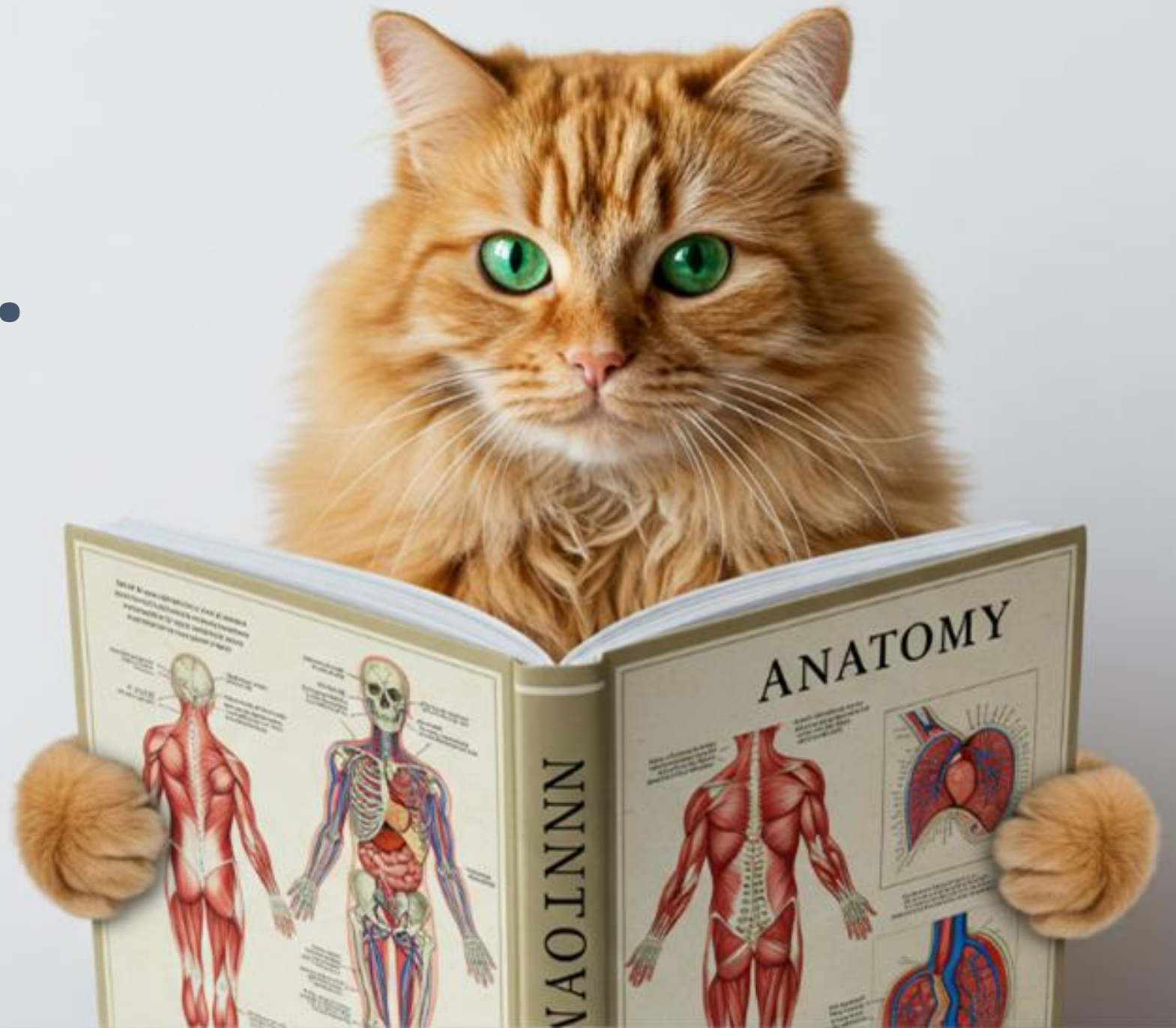
Jessica Faraci, MD, FAAFP

Objectives

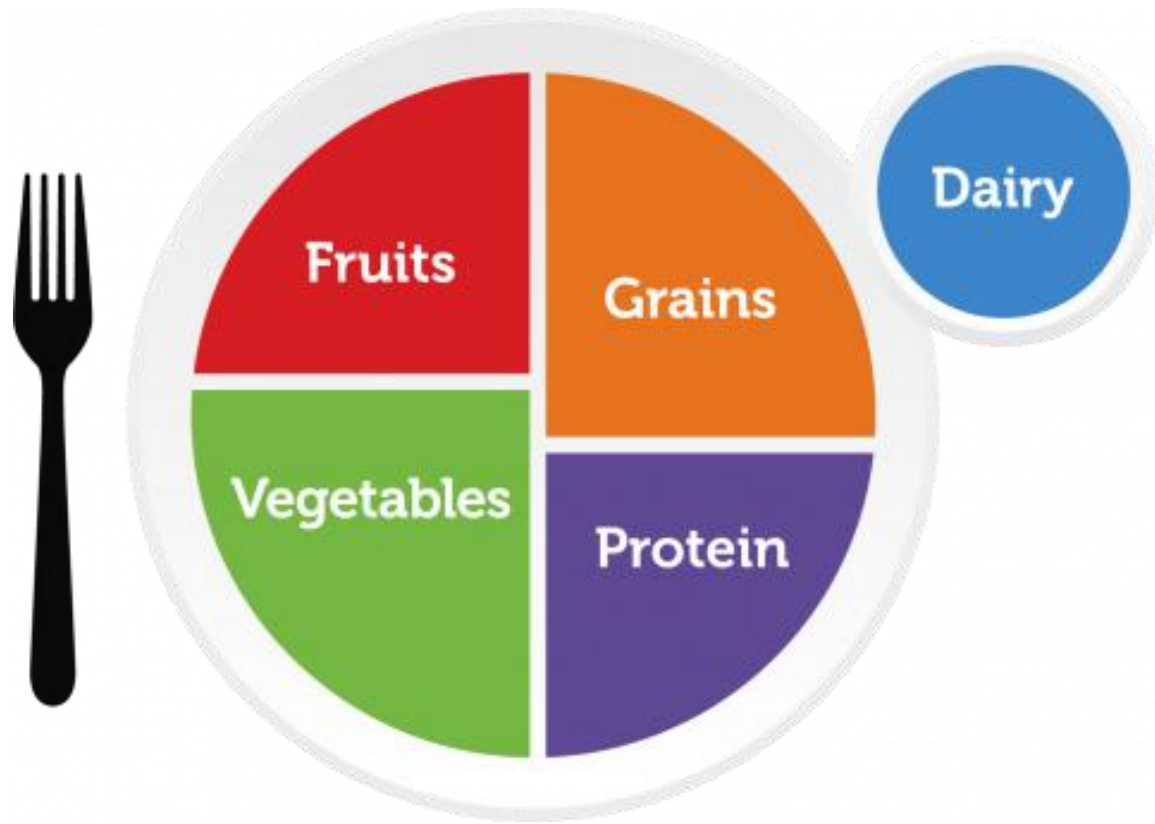
- Review definitions for protein, fat, carbs, fiber
- Review basic physiology and gut microbiome
- Review evidence basis for general dietary patterns, food groups
- Review evidence basis for dietary advice for high blood pressure, high cholesterol, and diabetes

At the end of this presentation, the learner should be able to **explain evidence based dietary patterns** to help patients, as well as **specific dietary changes to help common diseases**

Let's
Review...



MyPlate



“New Pyramid”



Protein

Building blocks

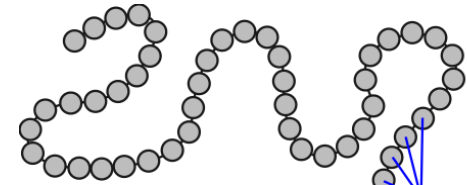
Structural
Storage
Hormones
Defense (antibodies)
Enzymes
Receptors
Transport
Globular
Fibrous (collagen, keratin, myosin)
Contractile (Muscle)



Protein

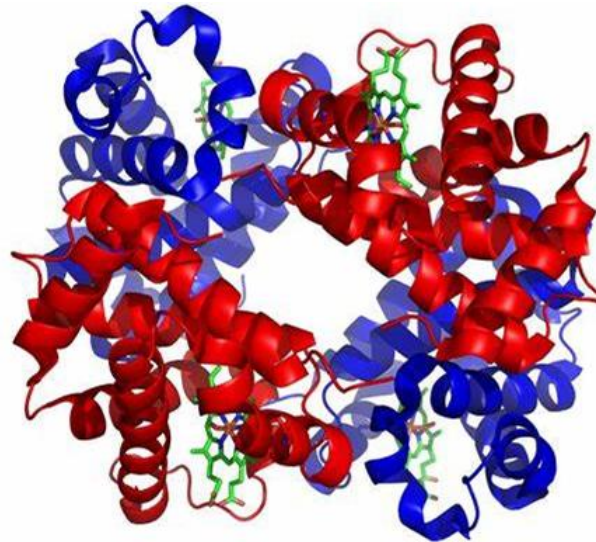
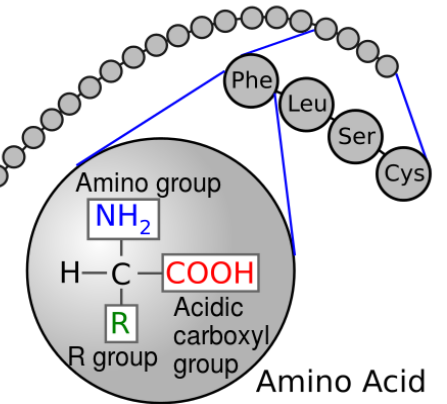
Building blocks

Structural
Storage
Hormones
Defense (antibodies)
Enzymes
Receptors
Transport
Globular
Fibrous (collagen, keratin, myosin)
Contractile (Muscle)



Primary Protein Structure
is sequence of a chain of amino acids

Amino Acids



Fats

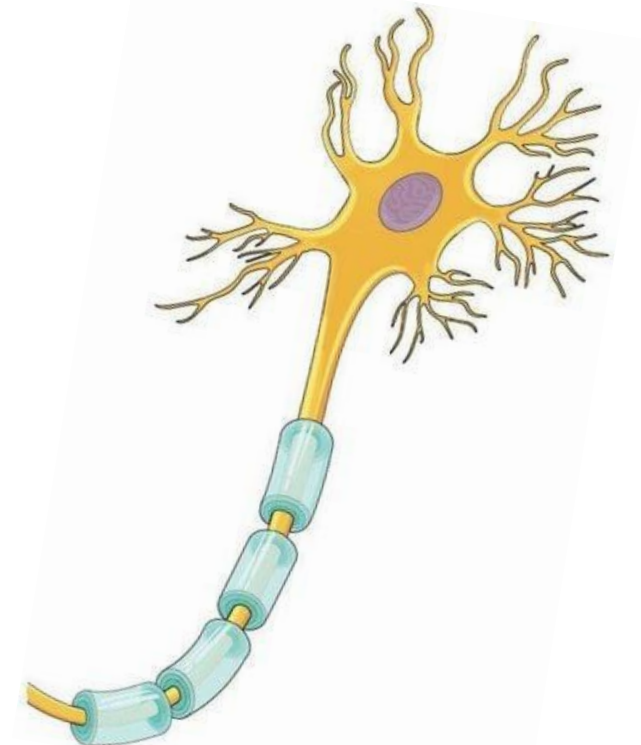
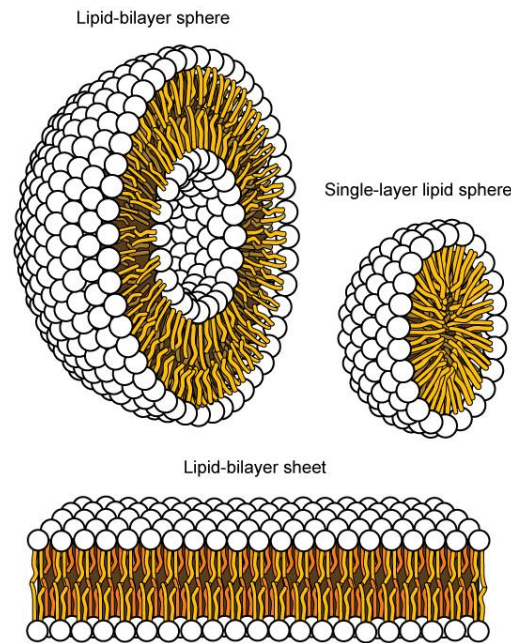
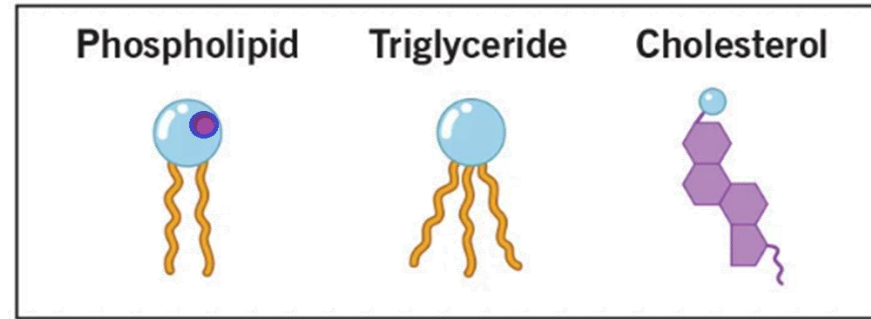
Energy storage
Vitamin/nutrient storage
Heat generation
Hormones
Cell membranes
Nerve insulation



Fats

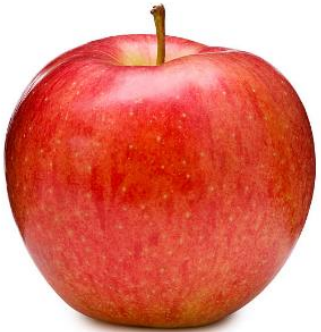
Energy storage
Vitamin/nutrient storage
Heat generation
Hormones
Cell membranes
Nerve insulation

Lipids



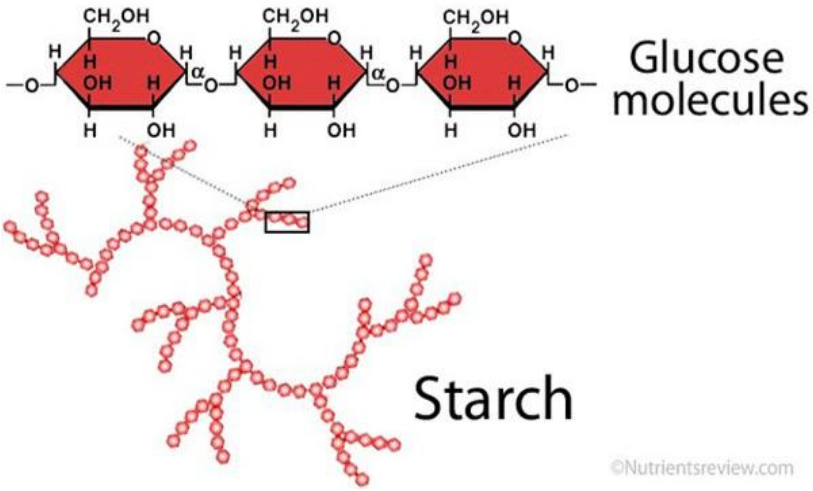
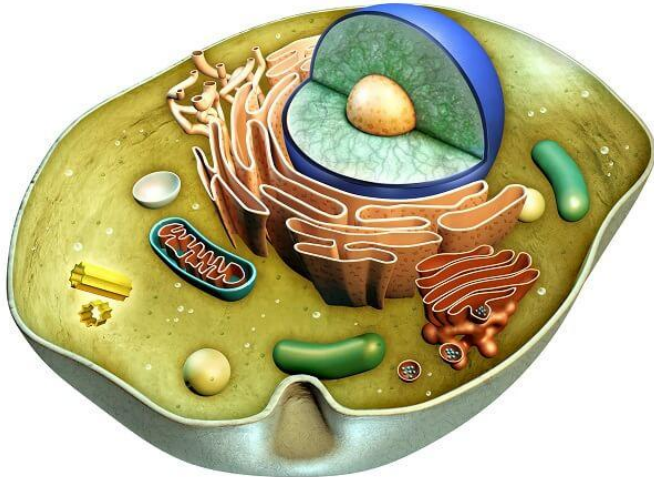
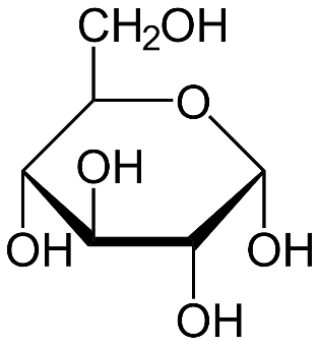
Carbohydrates

Energy
Sugar (glucose)

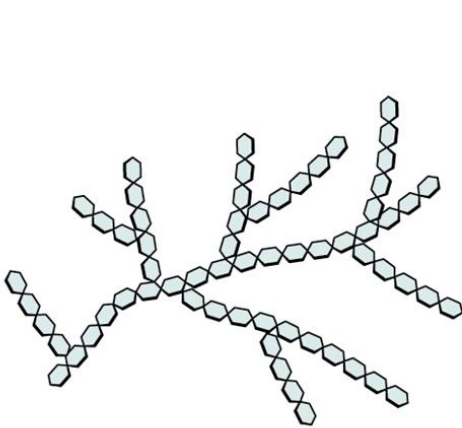


Carbohydrates

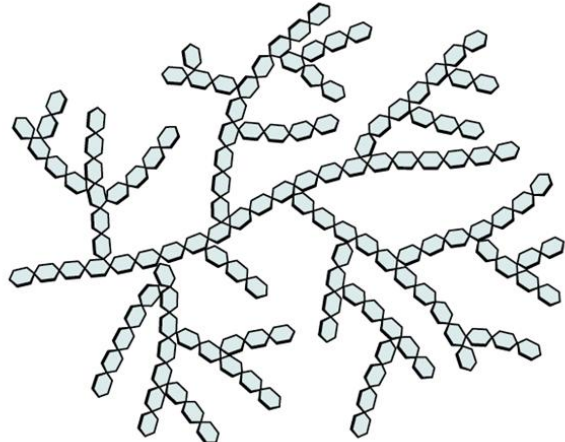
Energy
Sugar (glucose)



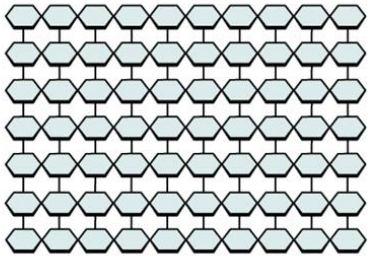
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Starch



Glycogen

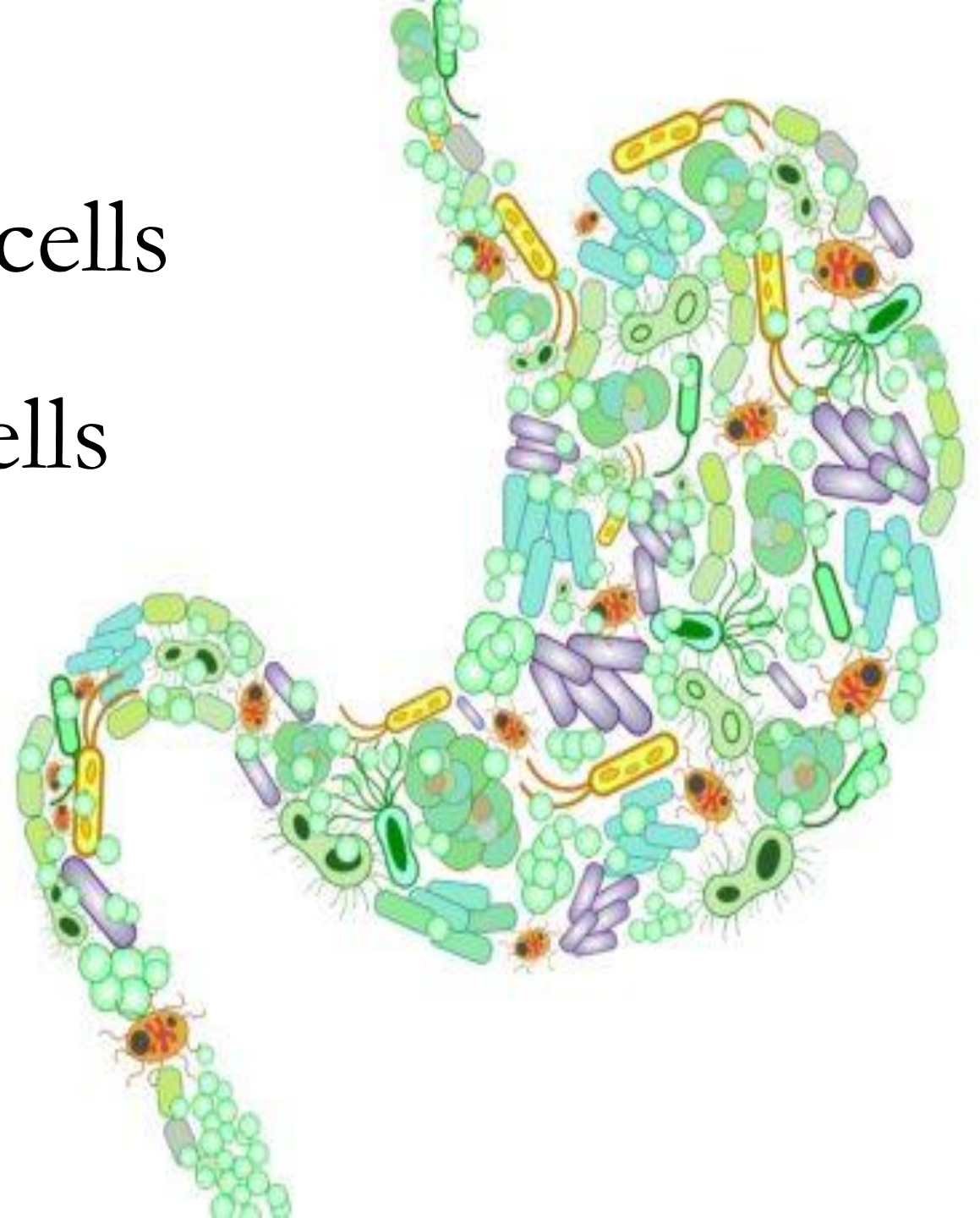


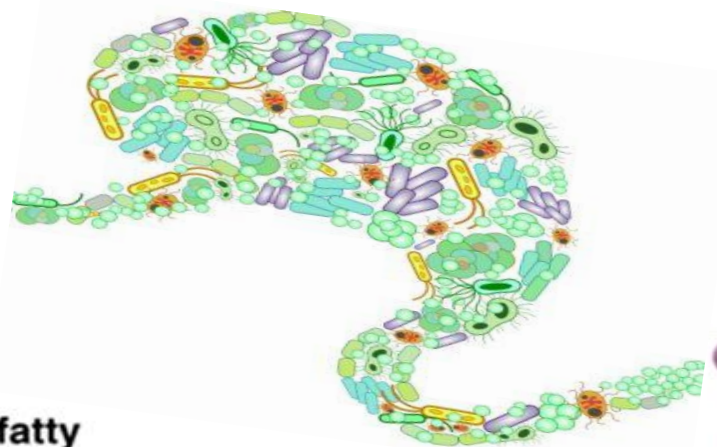
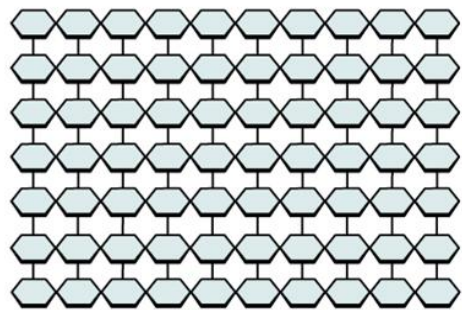
Cellulose (fiber)

~39 trillion bacterial cells

~30 trillion human cells

95% in the **gut**



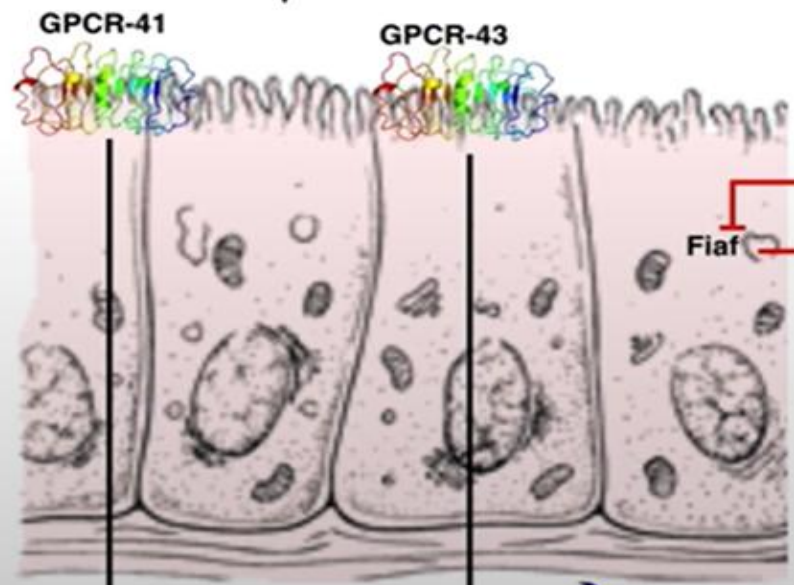


Short-chain fatty acids (SCFAs)

Acetate (2C)
Propionate (3C)
Butyrate (4C)

Microbial Fermentation

Gut Microbiota



Fiaf

Glucagon-like Peptide (GLP-1)

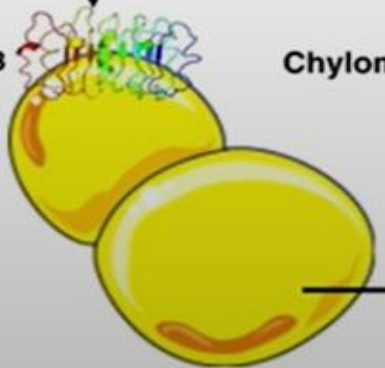
Peptide Tyrosine Tyrosine (PYY)

GPCR-43

Chylomicrons/VLDL

Lipoprotein Lipase

FFA

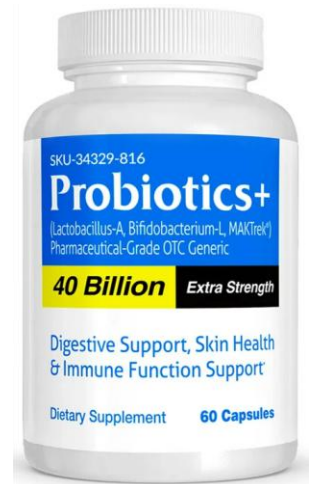
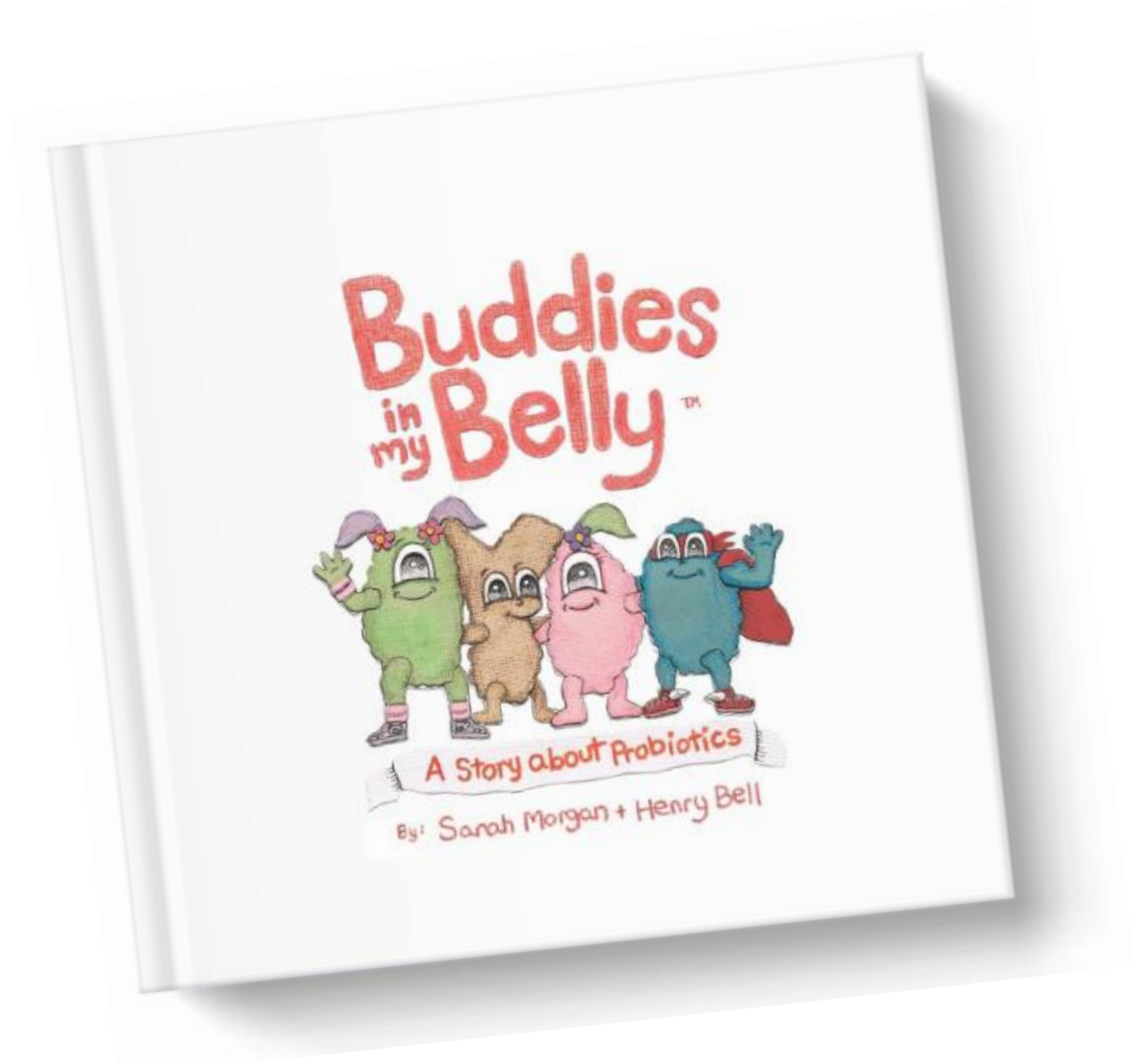


Adipocytes

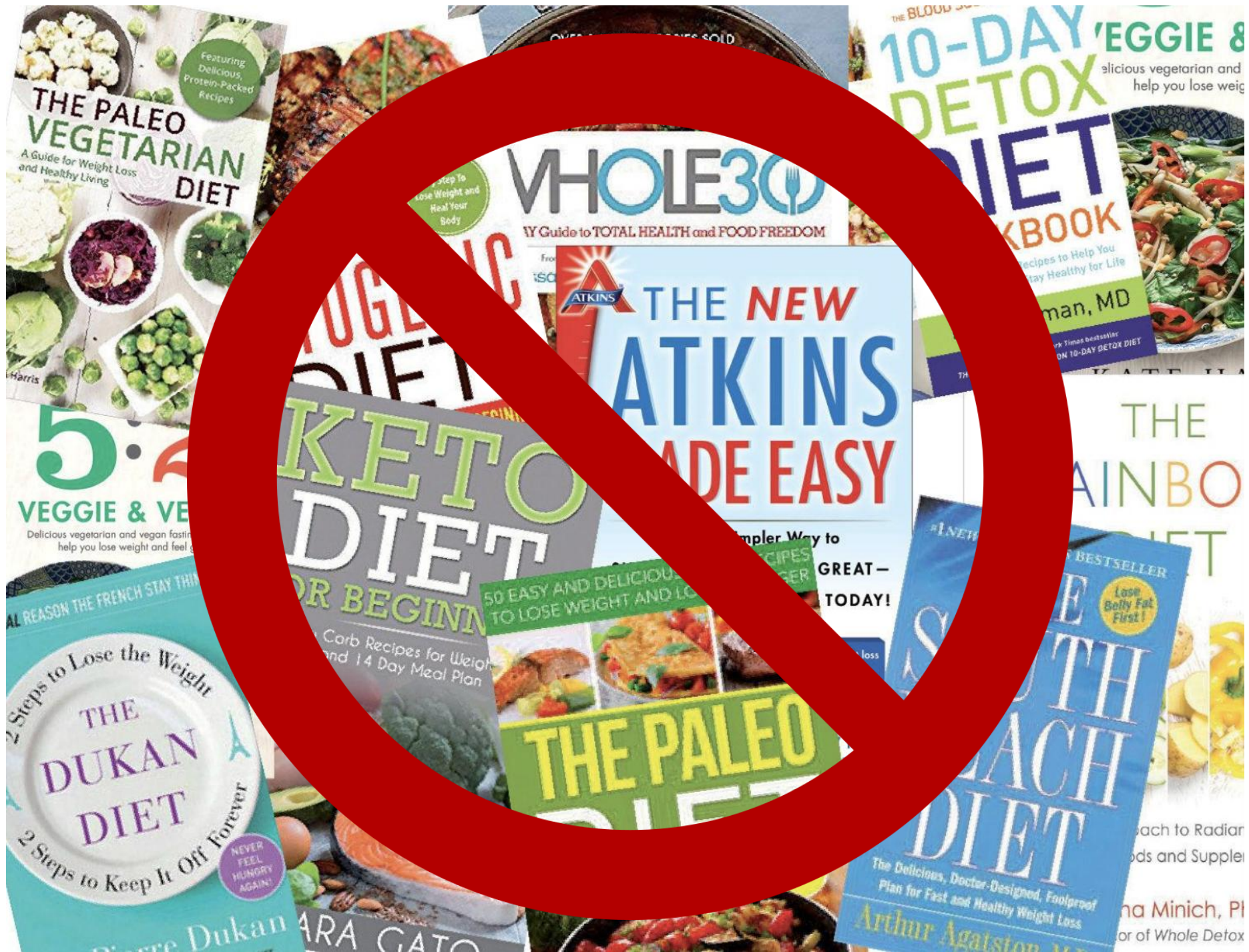
↓ Fat accumulation
↓ Insulin signaling



Prebiotics



Probiotics



**Let's Look
at the
Evidence...**



Mediterranean Diet

Mediterranean-style diet for the primary and secondary prevention of cardiovascular disease

✉ Karen Rees, Andrea Takeda, Nicole Martin, Leila Ellis, Dilini Wijesekara, Abhinav Vepa, Archik Das, Louise Hartley, Saverio Stranges Authors' declarations of interest

- Lowers risk of cardiovascular disease, specifically small reduction in strokes (24/1000 to 14/1000), helps mortality rates about the same as a low-fat diet
- Drops BP by 2-3 points, smaller gains in total cholesterol (not LDL / HDL / triglycerides)
- It probably decreases the risk of breast cancer and risk of dementia

Take Home:

Mediterranean diet is the most evidence-based diet. If you want to follow a specific diet, this is a good one to follow.

Systematic review of 30 RCT's for cardiovascular, single RCT's for breast cancer and dementia:

Mediterranean Diet and Invasive Breast Cancer Risk Among Women at High Cardiovascular Risk in the PREDIMED Trial: A Randomized Clinical Trial - PubMed (nih.gov)

Mediterranean Diet and Age-Related Cognitive Decline: A Randomized Clinical Trial - PubMed (nih.gov)

<https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD009825.pub3>

2013 PREDIMED study retracted in 2018

Fiber

Meta-Analysis > Lancet. 2019 Feb 2;393(10170):434-445. doi: 10.1016/S0140-6736(18)31809-9. Epub 2019 Jan 10.

Carbohydrate quality and human health: a series of systematic reviews and meta-analyses

Andrew Reynolds¹, Jim Mann², John Cummings³, Nicola Winter⁴, Evelyn Mete⁴, Lisa Te Morenga⁵

Cochrane Database of Systematic Reviews | Review - Intervention

Dietary fibre for the primary prevention of cardiovascular disease

Louise Hartley, Michael D May, Emma Loveman, Jill L Colquitt, Karen Rees Authors' declarations of interest

Version published: 07 January 2016 Version history

<https://doi.org/10.1002/14651858.CD011472.pub2>

Review > Am J Clin Nutr. 2017 Dec;106(6):1514-1528. doi: 10.3945/ajcn.117.163246. Epub 2017 Nov 1.

Effects of isolated soluble fiber supplementation on body weight, glycemia, and insulinemia in adults with overweight and obesity: a systematic review and meta-analysis of randomized controlled trials

Sharon V Thompson¹, Bridget A Hannon¹, Ruopeng An^{1,2}, Hannah D Holscher^{3,2,4}

Dietary fibre for the prevention of recurrent colorectal adenomas and carcinomas

Yibo Yao, Tao Suo, Roland Andersson, Yongqing Cao, Chen Wang, Jingen Lu, Evelyn Chui Authors' declarations of interest

Version published: 08 January 2017 Version history

<https://doi.org/10.1002/14651858.CD003430.pub2>

- Fiber allows ~5.5 pounds of weight loss and decrease in BMI by ~0.84
- Fiber lowers BP, fasting glucose (by 3.2 mg/dL), body fat, total cholesterol, and LDL (5-6 mg/dL)
- Risk reduction greatest with daily fiber intake >25 grams
- Might also decrease mortality, heart attacks, stroke, diabetes, depression, and cancer (>8 years)

Take Home:

Fiber is amazing. Try for >25 grams per day. If you supplement, use a soluble fiber supplement up to 10 grams per day. Indigenous diets regularly eat >50 grams per day

Systematic review of 58 RCT's with >4600 patients: Carbohydrate quality and human health..... <https://pubmed.ncbi.nlm.nih.gov/30638909/>

Systematic review of 12 RCT's with >600 patients. Fiber supplementation. <https://pubmed.ncbi.nlm.nih.gov/36692989/>

Dietary fiber for the primary prevention of cardiovascular disease.

<https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD011472.pub2/full?highlightAbstract=fiber%7Cfibre%7Cfibr%7Cdietary%7Cdietari>

Dietary fibre for the prevention of recurrent colorectal adenomas and carcinomas - PubMed (nih.gov) - 7 RCTs of >4700 pts show no reduction of colon cancer in 8 yrs

Systematic review of 22 populations. Indigenous cultures and diet. <https://pubmed.ncbi.nlm.nih.gov/35252289/>

Saturated Fat

Reduction in saturated fat intake for cardiovascular disease

Lee Hooper¹, Nicole Martin², Oluseyi F Jimoh¹, Christian Kirk¹, Eve Foster¹, Asmaa S Abdelhamid¹

- Eating less saturated fats decreases absolute risk of strokes by ~2%.
 - 56 people reducing saturated fat for ~4 years = prevents 1 nonfatal stroke.
 - Greater reductions in saturated fat had greater reductions in risk.
- Little to no effect on all-cause or cardiovascular mortality, non-fatal myocardial infarction, cancer, or diabetes diagnoses.
- Replacing with polyunsaturated fat or carbs can help, replacing with monounsaturated fat unclear.

Take Home:

Saturated fat is not great for you, but not as bad as we thought. Reducing it in your diet will help reduce risk of stroke a little. Try and replace some saturated fats with healthier fats.

Intermittent Fasting / Caloric Restriction

> Front Nutr. 2022 May 2;9:871682. doi: 10.3389/fnut.2022.871682. eCollection 2022.

Effects of Intermittent Fasting in Human Compared to a Non-intervention Diet and Caloric Restriction: A Meta-Analysis of Randomized Controlled Trials

Lihu Gu ¹, Rongrong Fu ², Jiase Hong ³, Haixiang Ni ⁴, Kepin Yu ², Haiying Lou ⁵

Meta-Analysis > Obesity (Silver Spring). 2020 Jun;28(6):1098-1109. doi: 10.1002/oby.22791.

Epub 2020 Apr 18.

Breakfast Skipping, Body Composition, and Cardiometabolic Risk: A Systematic Review and Meta-Analysis of Randomized Trials

- Intermittent fasting showed lower weight / waist circ, lower BMI, cholesterol, and TG compared to regular diet.
- Caloric restriction had the same outcomes, except for reduced waist circumference.
- Skipping breakfast caused ~1.2 pounds of weight loss over 8 weeks, but may increase LDL

Take Home:

You don't have to have three meals a day. Intermittent fasting mostly works by restricting calories. For some people it can help lose a couple pounds, but it is not for everyone.

Salt

Cochrane Database of Systematic Reviews | Review - Intervention

Replacing salt with low-sodium salt substitutes (LSSS) for cardiovascular health in adults, children and pregnant women

✉ Amanda Brand, Marianne E Visser, Anel Schoonees, Celeste E Naude Authors' declarations of interest

Version published: 10 August 2022 Version history

Cochrane Database of Systematic Reviews | Review - Intervention

Reduced dietary salt for the prevention of cardiovascular disease

✉ Alma J Adler, Fiona Taylor, Nicole Martin, Sheldon Gottlieb, Rod S Taylor, Shah Ebrahim Authors' declarations of interest

Version published: 18 December 2014 Version history

- Reducing salt doesn't reduce deaths in the general population
- Reducing salt prevents some heart attacks / strokes in patients with HTN, largely by reducing BP (2-4 points)
- Salt substitutes reduce diastolic BP (2.4 mmHg) and systolic BP (4.8 mmHg), non-fatal cardiovascular events (20-180 events per 100,000 person years), and cardiovascular mortality slightly in adults. It also probably slightly increases potassium.

Take Home:

Eating less salt lowers your blood pressure. It is more important if you have hypertension, since it then will reduce heart attacks, strokes, and deaths. Adding a salt substitute can be a helpful strategy.

Omnivorous vs Vegan

Randomized Controlled Trial > JAMA Netw Open. 2023 Nov 1;6(11):e2344457.
doi: 10.1001/jamanetworkopen.2023.44457.

Cardiometabolic Effects of Omnivorous vs Vegan Diets in Identical Twins: A Randomized Clinical Trial

Randomized Controlled Trial > Nutr Diabetes. 2018 Nov 2;8(1):58.
doi: 10.1038/s41387-018-0067-4.

A plant-based diet in overweight individuals in a 16-week randomized clinical trial: metabolic benefits of plant protein

- 22 pairs of identical twins randomly assigned healthy vegan vs healthy omnivorous diet for 8 weeks
- The vegan diet twins were healthier. Decreases in LDL (13.9 mg/dL), fasting insulin level (2.9 mIU/L), and body weight (4.2 pounds)
- Another study of 75 randomized participants. Vegan group lost average of 14.3 pounds in 12 weeks, and decreased insulin resistance and fat mass

Take Home:

Plant based diets are very good for us, and reducing dairy and meat may be a good idea.

1 RCT, n=22, Identical Twin 8 weeks omnivorous vs vegan. <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2812392>

1 RCT, n=75, vegan diet. <https://pubmed.ncbi.nlm.nih.gov/30405108/>



Fruit
2-3 servings daily



Vegetables
2-3 servings daily



Legumes
3-4 servings weekly



Nuts
7 servings weekly

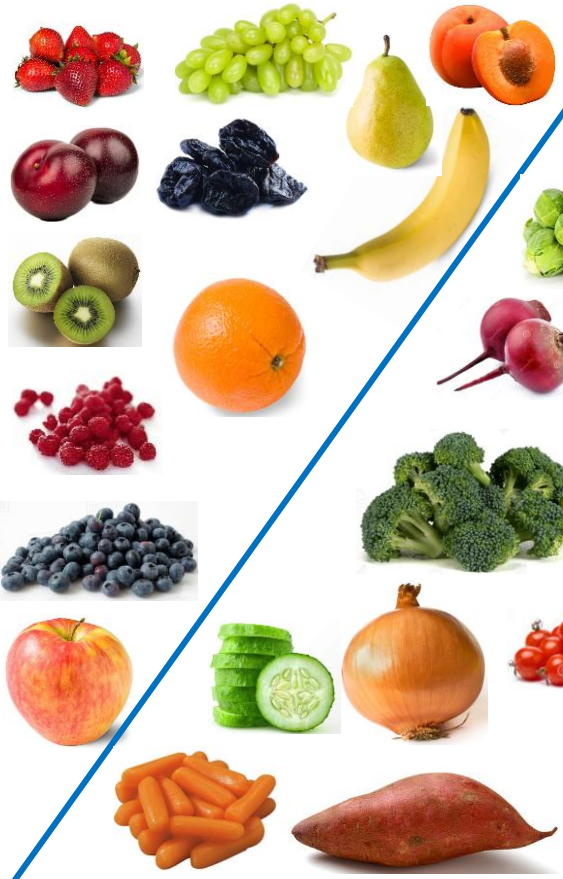


Fish
2-3 servings weekly



Dairy
14 servings weekly

1 serving fruit = ~150 grams
(one apple, one banana, one orange, one pear, two apricots, two kiwi, two plums, 5 prunes, 8 strawberries, 30 raspberries, 36 grapes, 78 blueberries)



2-3 a day

1 serving vegetable = ~150 grams
(one pepper, 15 baby carrots, 20 cherry tomatoes, 9 mushrooms, 6 broccoli, one sweet potato, one medium onion, 2 cups kale, 2 beets, 8 Brussel sprouts, 1/3 cucumber, 1 corn)



2-3 a day

1 every other day

1 serving legume = ~100 grams
(1 cup of chickpeas, 1 cup kidney beans, 1 cup lentils, 1 cup lima beans, 1/2 cup of black beans, 1/2 cup green peas)



1 a day

1 serving nuts = ~30 grams
(one handful, which is ~30 almonds, ~18 cashews, ~35 peanuts, 2 tablespoons of peanut butter, 49 pistachios, 15 walnuts, 15 macadamia nuts, 21 hazelnuts)



1 every few days

1 serving fish = ~100 grams
(3 ounces = pack of cards, of any fish including Atlantic mackerel, salmon, rainbow trout, haddock, herring, 1 tin of sardines, 1 can Albacore tuna, ~5 scallops, ~20 mussels)



2 a day

1 serving = ~40 grams cheese
~200 grams yogurt/milk
(1 cup milk, 1 cup soy milk, 1 cup yogurt, 2 cups cottage cheese, 1/2 cup ricotta cheese, 1.5 ounces hard cheese like cheddar mozzarella swiss or parmesan, 2 ounces queso fresco, 1 ounce goat cheese)



Chronic Diseases



Hypertension



What's the most effective for hypertension?



~10 mmHg

~15 mmHg for 20mg



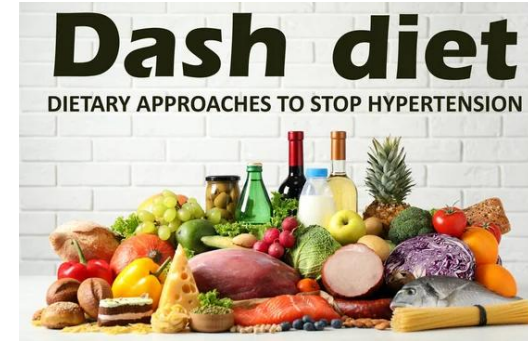
~10 mmHg

Must be freshly ground
Store in fridge / freezer
Supplements don't work



~8 mmHg

Isometric & running
4-6 mmHg other exercise



~7 mmHg

Decreased sodium
<1500 mg
Increased potassium
>3500 mg

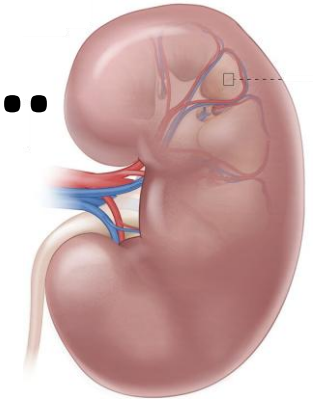


~5 mmHg

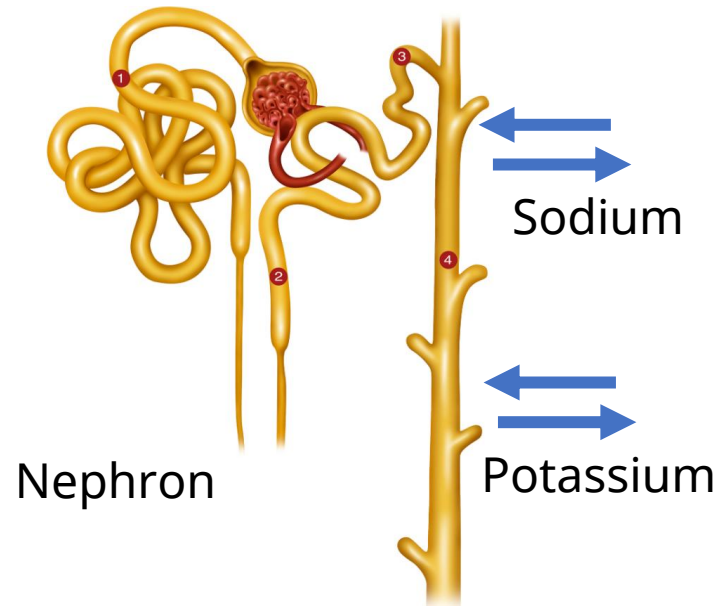
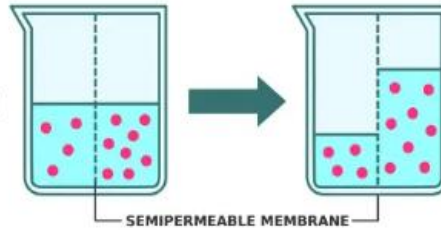
Low sodium salt
substitutes, usually
Potassium chloride
(safe unless severe CKD)

RCT, n= 110, 6 months. 2014. Potent Antihypertensive Action of Dietary Flaxseed in Hypertensive Patients. Caligiuri et al.
22 RCT's, n=1606. 2013. Effect of Increased potassium intake on cardiovascular risk factors and disease: systematic review and meta-analysis. Aburto et al.
Lisinopril: dose-peak effect relationship in essential hypertension. 1988. Br J Clin Pharmac.
270 RCT's, n=15827. 2023. Exercise training and resting blood pressure: a large scale pairwise and network meta-analysis or RCTs. Edwards et al.
133 RCTs, n=12,197. 2020. Effect of dose and duration of reduction in dietary sodium on blood pressure levels: systematic review and meta-analysis of randomized trials. BMJ.
Systematic review of 26 RCTs and >34k patients. Salt vs salt substitute. 2022 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9363242/>

It's all about the salt...and the potassium...



OSMOSIS
SOLVENT MOVE FROM
LOW TO HIGH
CONCENTRATION



Nephron

Water Follows the Salt



99.4% consume excess sodium

Only 2.5% of Americans are eating adequate potassium!!

Potassium RDA is 3400 mg/day for males
Potassium RDA is 2600 mg/day for females

Decrease Sodium Intakes

Eat less of these foods...

Fast-Food



Restaurant Foods



Processed Foods

Avoid packaged foods with >340 mg of sodium per serving



1/4 tsp

690 mg

Bread



Pizza



Hamburgers



Cold Cuts & Cured Meats



Canned Soup



Tacos & Burritos



Snack Foods

Chips, popcorn, pretzels and crackers



Fried/Breaded Chicken



Cheese



Increase Potassium Intakes

Eat as many of these foods as possible, every day...

Potato

(with skin, white or sweet potato)



926 mg

Avocado



690 mg

Beet Greens

(1/2 cup, cooked)



654 mg

White & Lima Beans

(3/4 cup)



735 mg

Lentils, Pinto, Kidney, Navy & Black Beans

(3/4 cup, cooked)



540 mg

Acorn Squash

(1/2 cup)



448 mg

Cantaloupe Melon

(1 cup)



427 mg

Banana



422 mg

Spinach

(1/2 cup cooked, 2 cups raw)



419 mg

Tomato Juice

(3/4 cup)



395 mg

Honeydew Melon

(1 cup)



388 mg

Tomato Sauce & Salsa

(1/2 cup)



364 mg

Chickpeas

(3/4 cup)



357 mg

Halibut & Tuna Fish

(3 oz)



350 mg

Yogurt & Milk

(1 cup)



345 mg

Artichoke



343 mg

Pomegranate

(1/2)



333 mg

Prunes

(1/4 cup)



318 mg

Cherries

(1 cup)



306 mg

Raisins

(1/4 cup)



299 mg

Goal <2300 mg, ideal <1500 mg

Goal 3500 mg to 4700 mg daily

Which has more sodium?



Corn
Muffin



Wake Up Wrap
(incl. eggs, cheese & bacon)

Which has more sodium?



Corn
Muffin

670
mg sodium



Wake Up Wrap
(incl. eggs, cheese & bacon)

590
mg sodium

Which has more sodium?



Cobb
Salad

Chick-fil-A

HOME OF
THE
Original
CHICKEN
SANDWICH



Original Chick-fil-A
Chicken Sandwich

Which has more sodium?



Cobb
Salad

2220
mg sodium



HOME OF
THE
Original
CHICKEN
SANDWICH



Original Chick-fil-A
Chicken Sandwich

1460
mg sodium

Which has more sodium?



Cobb
Salad

2220
mg sodium



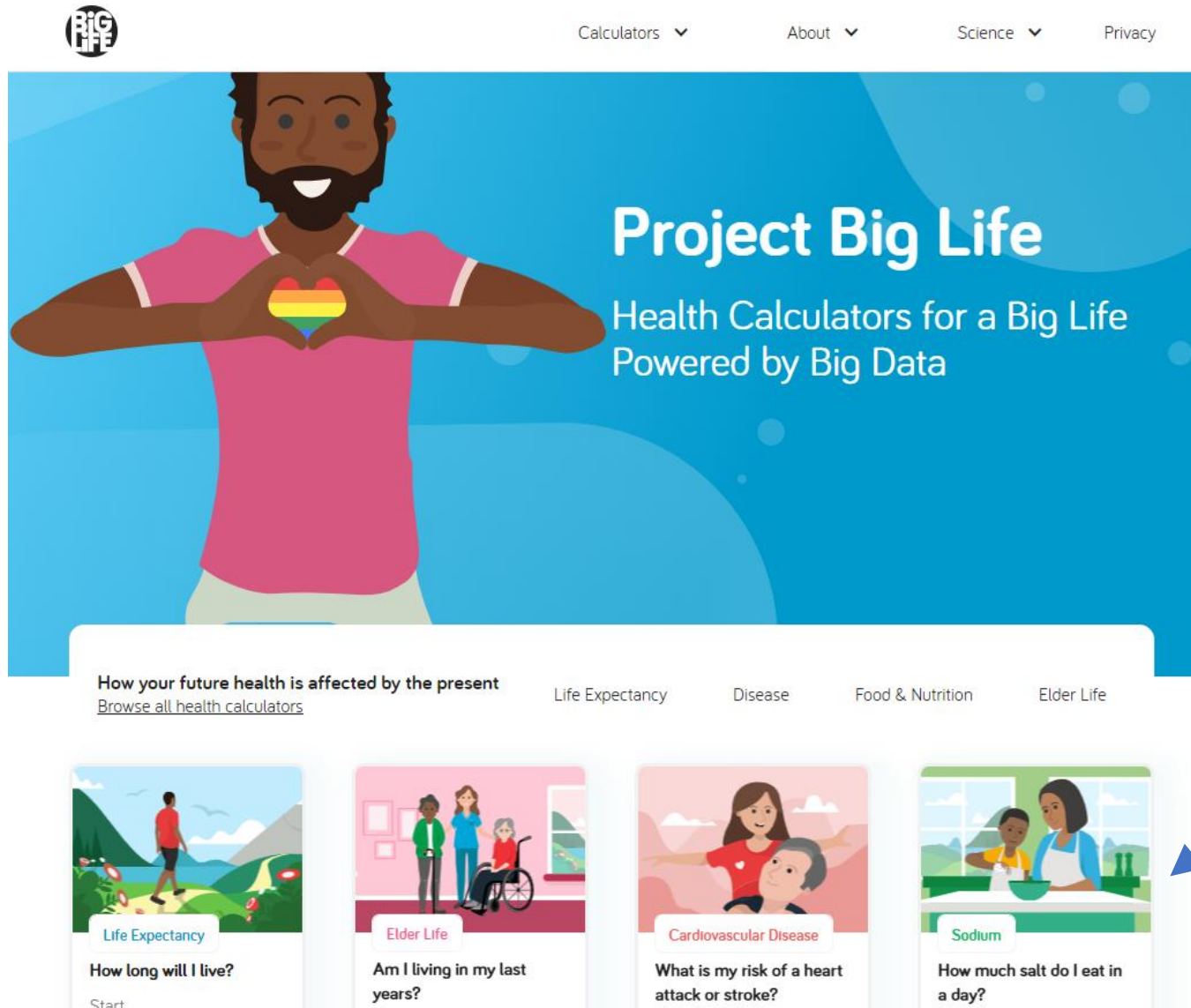
MORE OF
THE
Original
CHICKEN
SANDWICH



Original Chick-fil-A
Chicken Sandwich

1460
mg sodium

How Much Sodium do you Eat?



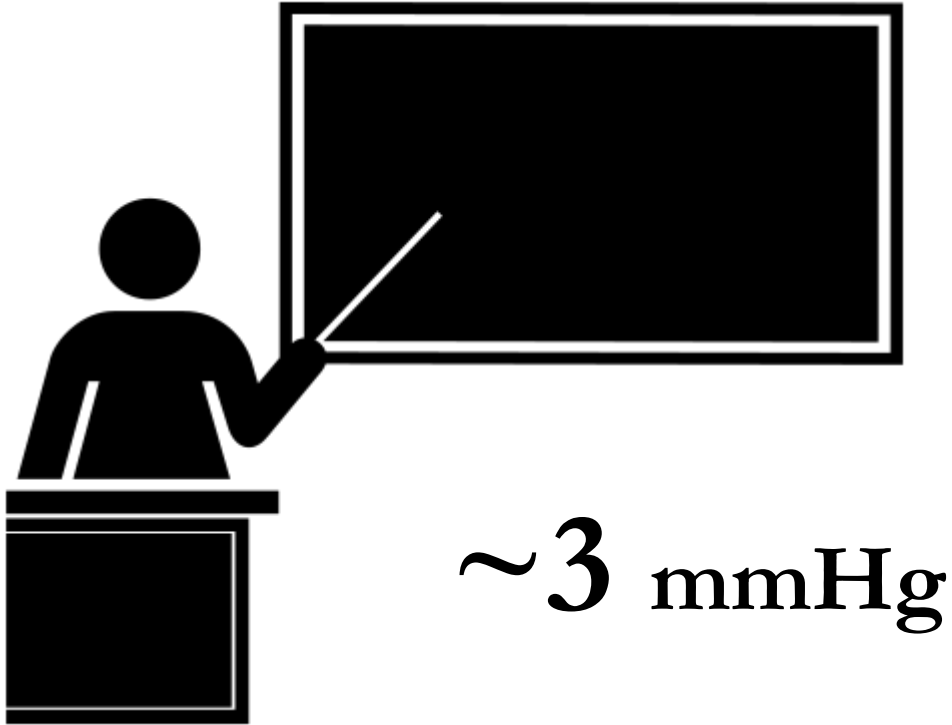
The image shows the Project Big Life website. At the top left is the 'BIG LIFE' logo. To its right are navigation links: 'Calculators', 'About', 'Science', and 'Privacy'. Below the navigation is a large blue banner featuring an illustration of a man with a beard and a rainbow heart. The banner text reads 'Project Big Life' and 'Health Calculators for a Big Life Powered by Big Data'. Below the banner is a white navigation bar with the text 'How your future health is affected by the present' and a link 'Browse all health calculators'. To the right of this text are four category links: 'Life Expectancy', 'Disease', 'Food & Nutrition', and 'Elder Life'. Below the navigation bar is a grid of four calculator cards. The first card is 'Life Expectancy' with the question 'How long will I live?'. The second card is 'Elder Life' with the question 'Am I living in my last years?'. The third card is 'Cardiovascular Disease' with the question 'What is my risk of a heart attack or stroke?'. The fourth card is 'Sodium' with the question 'How much salt do I eat in a day?'. A blue arrow points from the text 'Projectbiglife.ca' to the 'Sodium' calculator card.

24-hour food log (paper or app),
count nutrition label sodium

OR

Projectbiglife.ca

And listening to this lecture helps too!



~3 mmHg

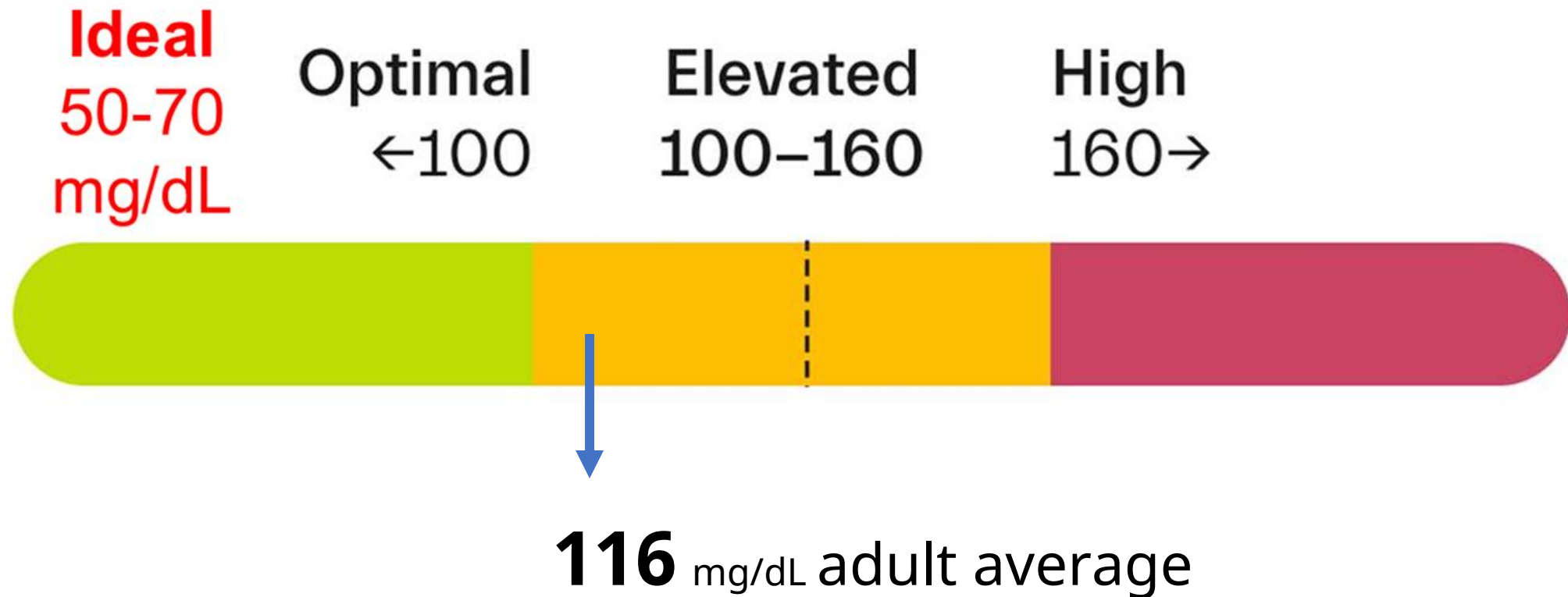
Dietary advice:

- Increases fruits/veggies >1 serving/day
- Increases fiber by >6 grams per day
- Decreases dietary fat by 4.5%
- Decreases saturated fat by 2.4%

Hyperlipidemia



What is your LDL?



What's the most effective for high LDL?



~50 mg/dL

~36 mg/dL for 5 mg



~44 mg/dL

45 min 3x/week

Aerobic +/- strength training



~33 mg/dL

Any nut type

Better if more

1/4 cup (handful) ~5 mg/dL



~22 mg/dL

Swap 47 g/day of animal for soy protein

~15 mg/dL to swap 3 tbsp butter for olive oil



~13 mg/dL

10 g (2 tsp)

Gummy/cookie versions too

Increase slowly!

Other daily food options:

Barley (3/4 cup)



~17 mg/dL

Berries (2 cups)



~8 mg/dL

Oats (1 cup)



~7 mg/dL

Beans (3/4 cup)



~7 mg/dL

Apples (2)



~6 mg/dL

Flaxseed (4 tbsp)

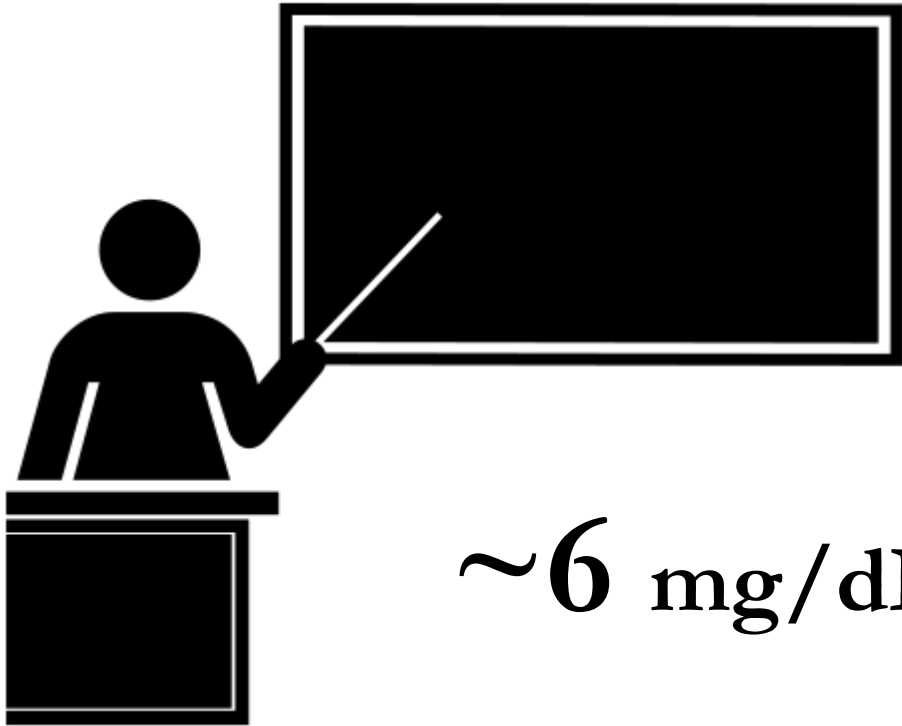


~3 mg/dL

Only partially additive, around **~35** mg/dL.

80/20 rule applies – take what you like!

And listening to this lecture helps too!



~6 mg/dL

Dietary advice:

- Increases fruits/veggies >1 serving/day
- Increases fiber by >6 grams per day
- Decreases dietary fat by 4.5%
- Decreases saturated fat by 2.4%

Diabetes



What's the most effective for diabetes?



~1.1 HbA1c

2,000 mg ~1.4 HbA1c



~0.9 HbA1c

>150 min/wk aerobic & resistance training

<150 min ~0.4 HbA1c

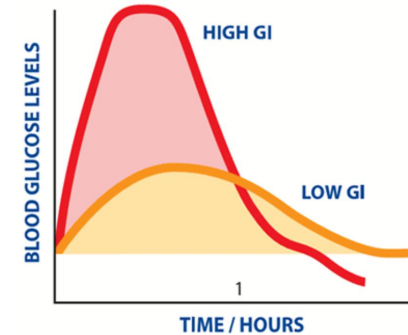


~1.5 HbA1c

Calorie restriction

Fast 6pm – 8am

5/2 (2 days fast/wk)



~0.5 HbA1c

↓ Glycemic Index

Low carbs (less sugar)



~0.5 HbA1c

18g fiber/day

Preferably in food, can be supplement

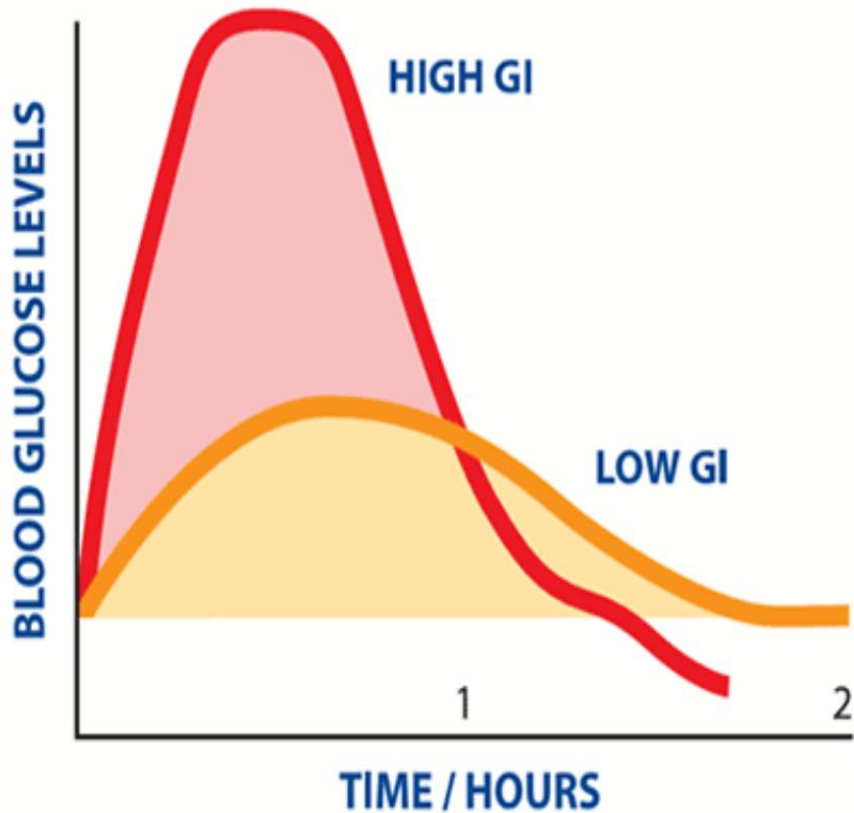
RCT n=120. 2012. Time-restricted feeding improves blood glucose and insulin sensitivity in overweight patients with type 2 diabetes: a randomized controlled trial.

47 RCTs, n=8538. 2011 JAMA. Physical Activity Advice Only or Structured Exercise Training and Association with HbA1c Levels in Type 2 Diabetes.

6 RCTs, n=705. The Effect of Dietary Glycaemic Index on Glycaemia in Patients with Type 2 Diabetes: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. 2018.

15 RCT's. n=324. Dietary fiber for the treatment of type 2 diabetes mellitus: a meta-analysis. 2012.

Glycemic Index (GI)



Nutritional quality

more important than GI
value of each food



19g carbs



27g carbs
3g fiber

Fiber Content



19 g (1 cup)



16 g (1 cup)



16 g (1 cup)



16 g (1 cup)



15 g (1 cup)



10 g (2 tbsp)



9 g (1)



8 g (1 cup)



7 g (1/2 cup)



6 g (1 cup)



2 - 5 g

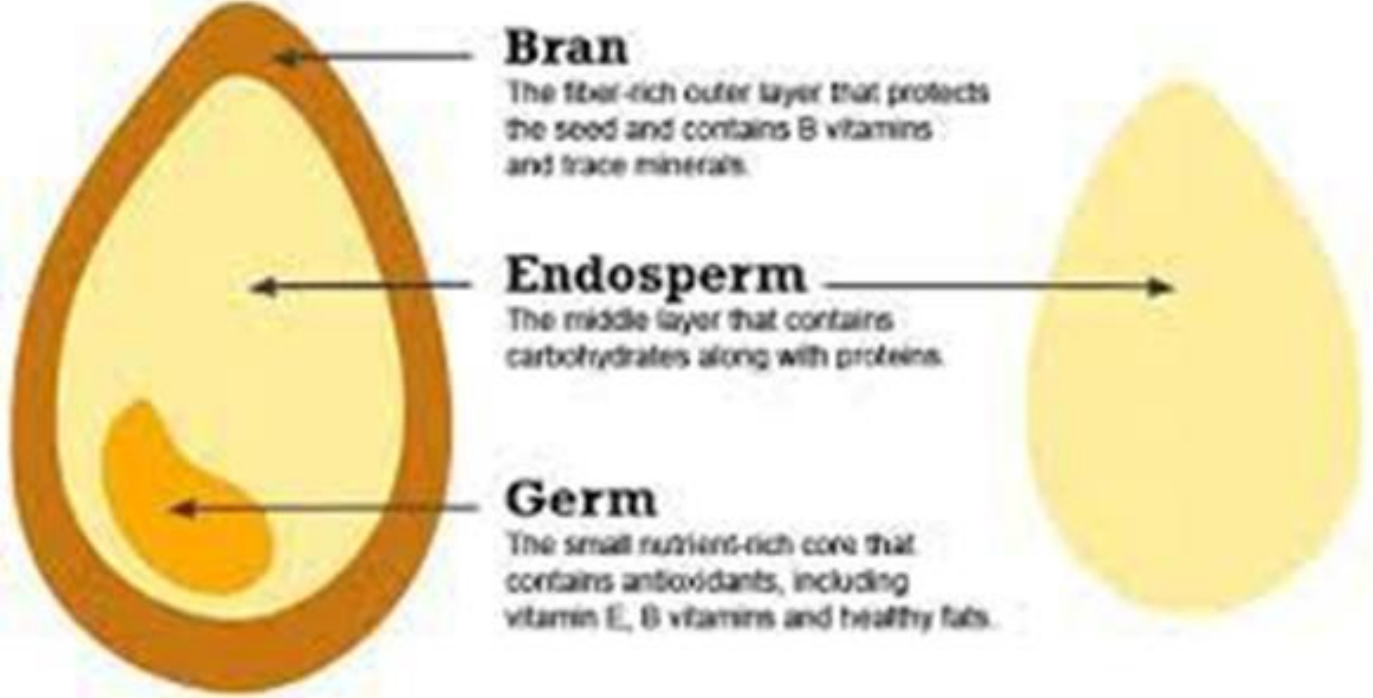
(Fruits and Veggies and whole grains)

Goal fiber >25-30 g/day

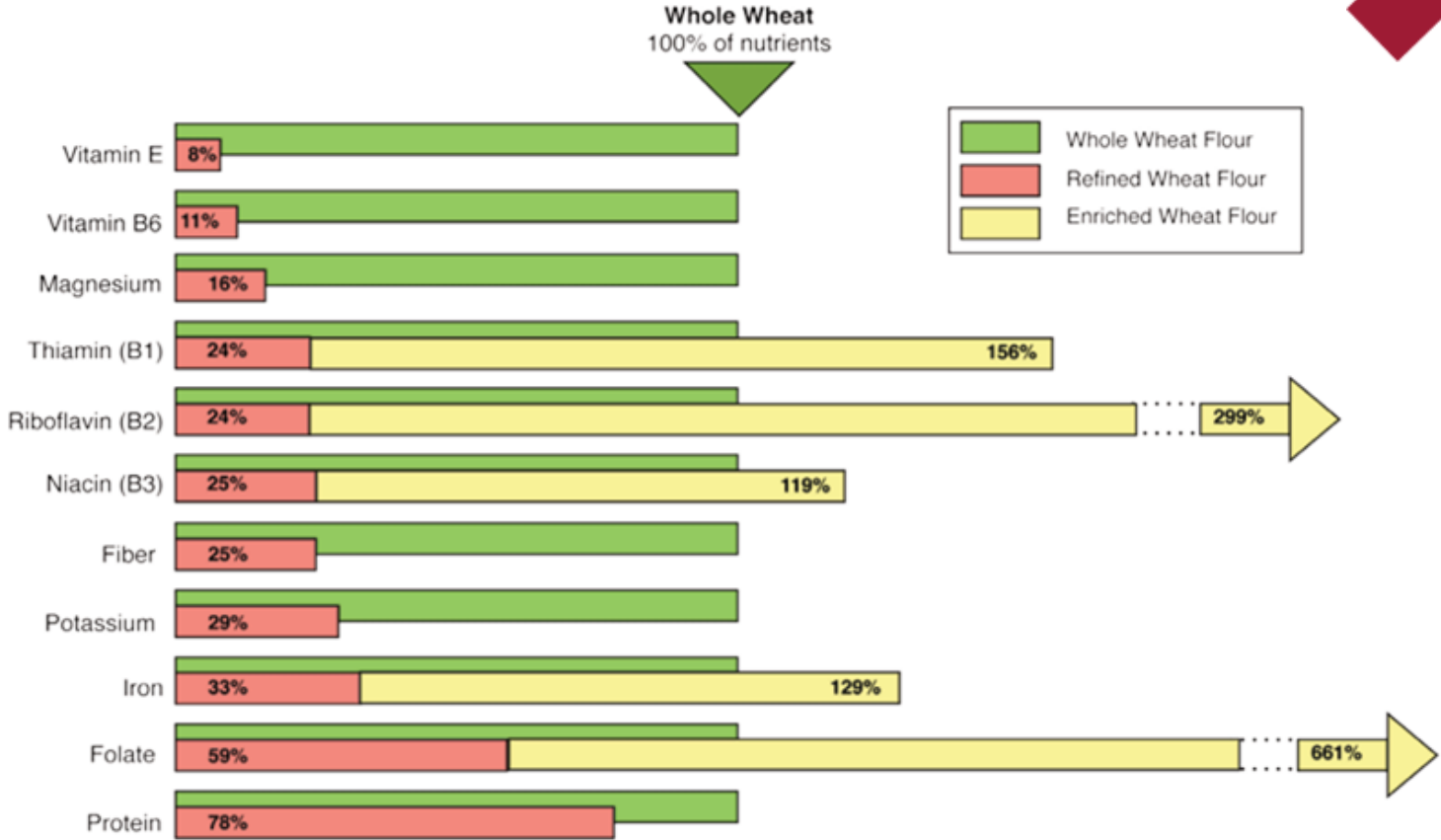
Carbohydrates vs Refined Carbohydrates



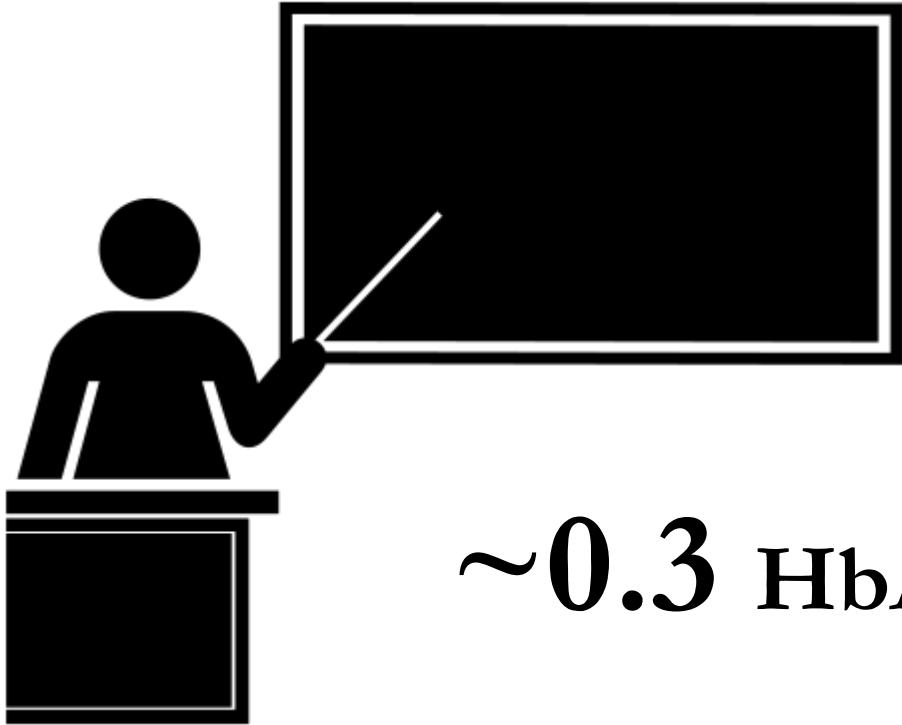
Whole Grain vs. "White" Grain



Carbohydrates vs Refined Carbohydrates



And listening to this lecture helps too!



~0.3 HbA1c

Same benefit if you
listen to this as a
recording!

So What Should I Eat and Why?

Eat food. Not too much. Mostly plants.

- Michael Pollan

- **Eat food:** actual food, not processed, no label. Less sugars/refined carbs.
- **Not too much:** watch quantity, okay to skip meals if that works for you
- **Mostly plants:** more fiber



