UVRA Nutrition Series
Session 3 – Farm to Table & Food to Human Cells:
Eating to Support Healthful Aging

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https://onlineacademiccommunity.uvic.ca/elderacademy

Topics for the Day

Nutrition & Chronic Diseases in Canadians 65+

Farm to Table

Food to Human Cells

Nutrients for Your Brain

Nutrients for Your Muscles

PREVALENCE OF CHRONIC DISEASES AND RISK FACTORS AMONG CANADIANS AGED 65+

73% of individuals aged 65+ years have at least **1 of 10** common chronic diseases[1]

PREVALENCE OF THE MOST COMMON CHRONIC DISEASES AND CONDITIONS

HYPERTENSION	PERIODONTAL DISEASE	OSTEOARTHRITIS	ISCHEMIC HEART DISEASE	DIABETES
65.7%	52.0%[2]	38.0%	27.0%	26.8%

OSTEOPOROSIS	CANCER	COPD	ASTHMA	MOOD & ANXIETY DISORDERS
25.1%	21.5%[3]	20.2%	10.7%	10.5%

Source: Health Canada 2020-12-16 - https://www.canada.ca/content/dam/phac-aspc/documents/services/publications/diseases-conditions/prevalence-of-chronic-disease-and-risk-factors/chronic-disease-infographic-en.pdf

Pharmaceuticals Associated with Weight Gain

Some common medications affect human metabolism:

1. *Diabetes*
   - Insulin and Sulfonylureas – stimulate appetite
   - Thiazolidinediones – increases subcutaneous fat & water retention
2. *Hypertension (high blood pressure)*
   - Beta-blockers – well known to cause weight gain in first few months
   - Calcium channel blocker flunarizine – increased appetite & weight gain
3. *Psychotropics (depression, anxiety, mood disorders, etc)*
   - Linked to increased abdominal obesity, insulin resistance, heart disease
4. *Anti-Seizure*
   - Weight gain and increased risk of type 2 diabetes
5. *Corticosteroids/glucocorticoids*
   - Weight gain in 70% of patients, with 20% gaining over 10 kg in first year.
   - Specifically abdominal fat → increased risk of type 2 diabetes and heart disease.
6. *Antiretroviral (HIV)*
   - Subcutaneous fat in the limbs & face, abdominal fat

Source: https://www.ncbi.nlm.nih.gov/books/NBK537590/

PREVALENCE OF CHRONIC DISEASES AND RISK FACTORS AMONG CANADIANS AGED 65+

73% of individuals aged 65+ years have at least **1 of 10** common chronic diseases[1]

PREVALENCE OF COMMON BEHAVIOURAL RISK FACTORS

9.5% report daily or occasional tobacco use[3]

77.3% consume fruits/vegetables less than 5x a day[4]

60.6% do not meet physical activity guidelines[3]

8.3% report exceeding low-risk drinking guidelines[3]

40.1% & 28.1% report a BMI in the overweight & obese categories[3]

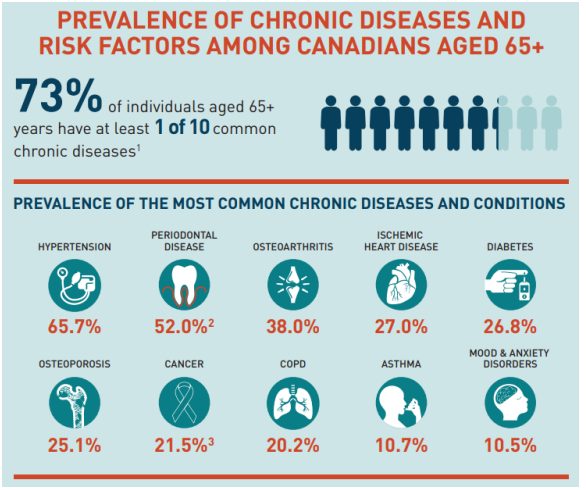
46.8% report trouble falling asleep[5]

Source: Health Canada 2020-12-16 - https://www.canada.ca/content/dam/phac-aspc/documents/services/publications/diseases-conditions/prevalence-of-chronic-disease-and-risk-factors/chronic-disease-infographic-en.pdf

Common Medical Concerns with Aging

Most prevalent chronic diseases in older (65+) Canadians:

1. Hypertension (high blood pressure)
2. Periodontal disease
3. Osteoarthritis
4. Heart disease
5. Diabetes (type 2) – 1.3x more prevalent in men
6. Osteoporosis - 4x more prevalent in women
7. Cancer
8. COPD
9. Asthma
10. Mood & Anxiety disorders



Source: Health Canada 2020-12-16 - https://www.canada.ca/en/public-health/services/publications/diseases-conditions/aging-chronic-diseases-profile-canadian-seniors-executive-summary.html

Common Medical Concerns with Aging

Most prevalent chronic diseases in older (65+) Canadians:

1. Hypertension (high blood pressure)
   - Related to salt (sodium intake) & exercise
   - Health Canada recommends that most Canadians consume 1500 milligrams (mg) per day and not exceed 2300 mg per day, which is the equivalent of just over one teaspoon of salt.

Source: https://www.canada.ca/en/health-canada/services/food-nutrition/healthy-eating/sodium.html

Common Medical Concerns with Aging

Most prevalent chronic diseases in older (65+) Canadians:

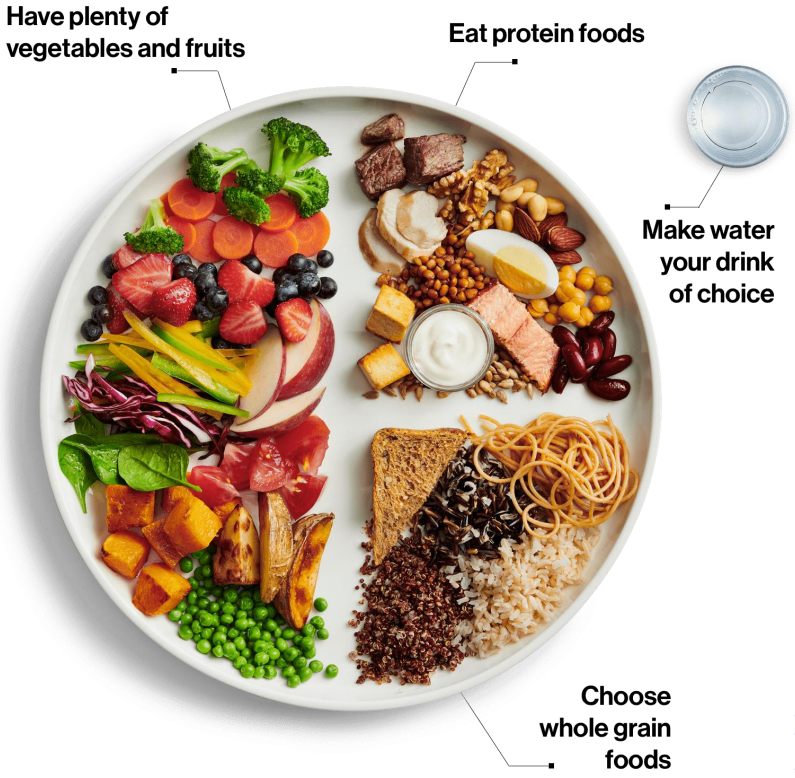
2. Periodontal disease
   - Related to sugar intake & oral cleaning habits
   - WHO recommends simple (free) sugar intakes of 25 grams (6 teaspoons) and an upper limit 50 grams (12 teaspoons) per day

Source: https://www.who.int/news/item/04-03-2015-who-calls-on-countries-to-reduce-sugars-intake-among-adults-and-children

Common Medical Concerns with Aging

Most prevalent chronic diseases in older (65+) Canadians:

3. Osteoarthritis
   - Related to being overweight and inflammation
   - Inflammation can be reduced by the *Mediterranean diet*
     - Olive oil & lots of fibrous plants (whole grains, legumes, vegetables & fruits)



Source: https://www.arthritis.org/health-wellness/healthy-living/nutrition/healthy-eating/mediterranean-diet-for-osteoarthritis

Common Medical Concerns with Aging

Most prevalent chronic diseases in older (65+) Canadians:

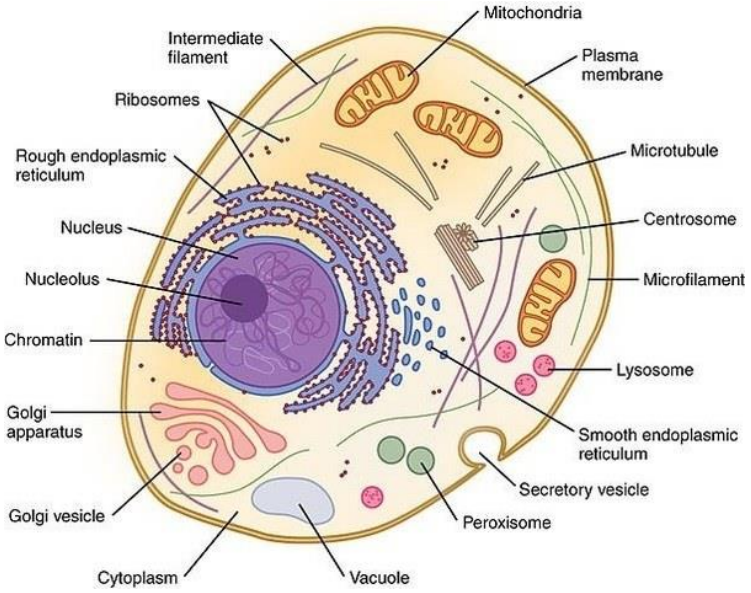
4. Heart disease
   - Related to exercise and diet
   - The best diet for preventing heart disease is one that is full of fruits and vegetables, whole grains, nuts, fish, poultry, and vegetable oils; includes alcohol in moderation, if at all; and goes easy on red and processed meats, refined carbohydrates (sugar), foods and beverages with added sugar, sodium, and foods with trans fat.

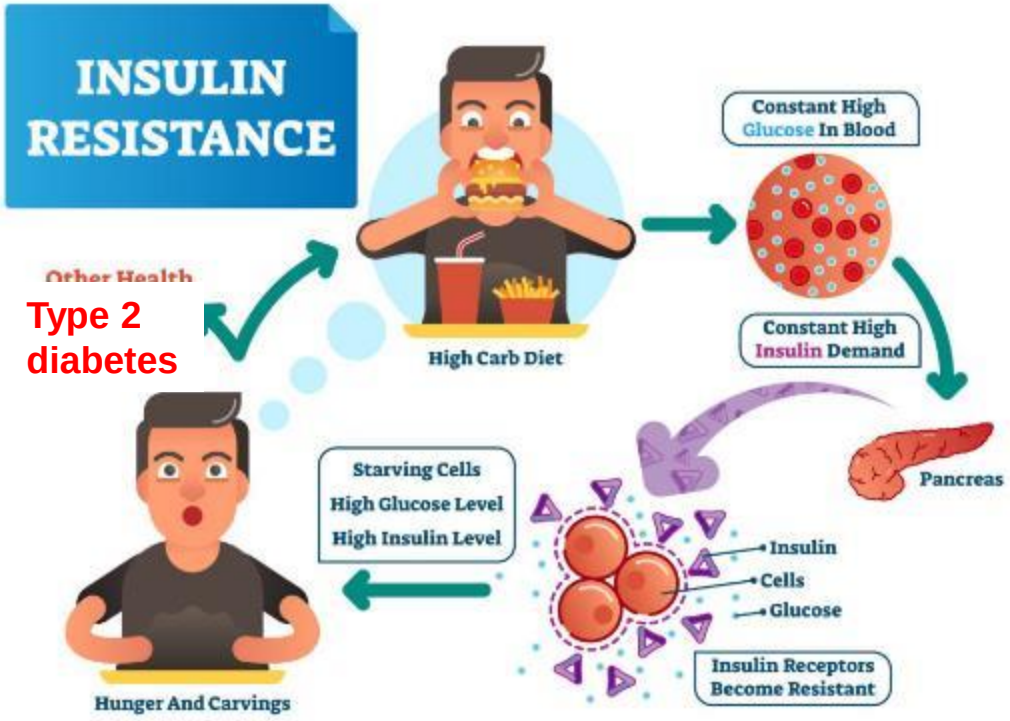
Source: https://www.hsph.harvard.edu/nutritionsource/disease-prevention/cardiovascular-disease/preventing-cvd/#:~:text=The%20best%20diet%20for%20preventing,sodium%2C%20and%20foods%20with%20trans

Common Medical Concerns with Aging

Most prevalent chronic diseases in older (65+) Canadians:

5. Diabetes (type 2) – 1.3x more prevalent in men
   - Related to exercise and diet
     - High chronic sugar intake results in insulin insensitivity (resistance)
     - Limit simple (free) sugar intake and focus on fibrous vegetables & fruits





Source: https://www.diabetes.ca/health-care-providers/clinical-practice-guidelines/chapter-11#panel-tab_FullText

Table 2.
Dietary fiber content of selected foods[a]

Food	Serving size	Total dietary fiber (g/serving)	Energy (kcal/serving)
Fruits			
Prunes, dried	5 prunes	3.4	114
Orange	1 fruit (2 ⅞-in diameter)	3.1	75
Apple with skin	1 large (3 ¼-in diameter)	5.4	116
Banana	1 large (8-in long)	3.5	121
Raisins	1 small box (1 oz)	1.0	84
Figs, dried	2 figs	1.6	42
Pear	1 medium pear	5.5	101
Raspberries	½ c	4.0	32
Strawberries, raw	1 c, sliced	3.3	53
Vegetables			
Beans, kidney, canned	½ c	5.5	108
Peas, split, cooked	½ c	8.1	116
Lentils, cooked	½ c	7.8	115
Lettuce, iceberg	1 c, shredded	0.9	10
Kale, raw	1 c, loosely packed	0.6	8
Spinach, cooked	½ c	2.2	21
Peas, green, canned	½ c	3.5	59
Carrots, raw	8 baby carrots	2.5	30
Potatoes, boiled	½ c	1.4	68

Dahl & Stewart, 2015

Potatoes, boiled	½ c	1.4	68
Potato, baked, skin-on	1 medium (2 ¾-in diameter)	3.3	138
Sweet potato, no skin	½ c mashed	4.1	125
Broccoli, raw	½ c	1.1	15
Celery, raw	½ c chopped	0.8	8
Beets, cooked	½ c sliced	1.7	37
Grains			
Raisin bran	1 c	7.4	190
Shredded wheat	2 biscuits	5.5	155
Rice, brown, cooked	1 c	3.5	218
Bread, white (refined wheat)	1 slice	0.8	77
Bread, whole wheat	1 slice	1.9	81
Oatmeal, cooked	¾ c	3.0	124
Rye crispbread	1 wafer	1.6	37
Crackers, graham	2 squares	0.5	60
Nuts			
Almonds	¼ cup	4.5	207
Walnuts	¼ cup, pieces	2.0	196

a Data from US Department of Agriculture, Agricultural Research Service.[8]

Dahl & Stewart, 2015

Common Medical Concerns with Aging

Most prevalent chronic diseases in older (65+) Canadians:

6. Osteoporosis - 4x more prevalent in women
   - Related to weight-bearing exercise & calcium and vitamin D intake

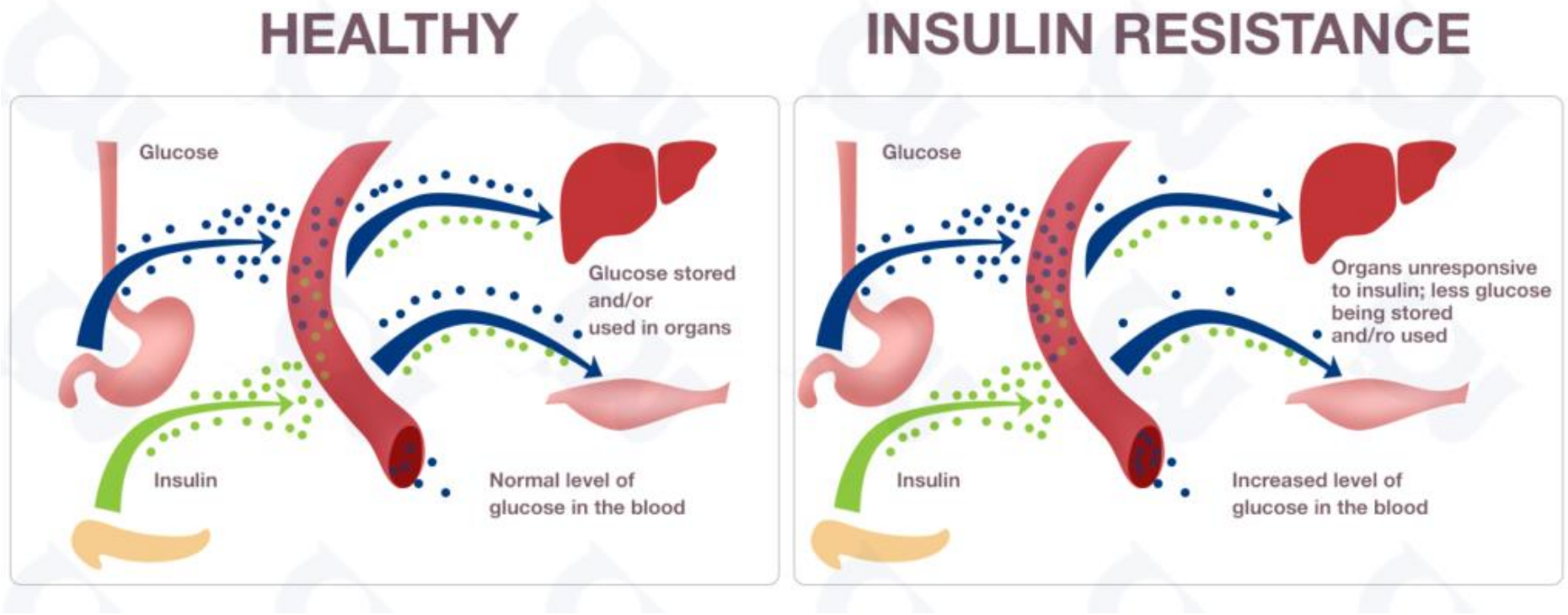
FOOD	NUTRIENT
Dairy products such as low-fat and non-fat milk, yogurt and cheese	Calcium. Some dairy products are fortified with Vitamin D.
Fish	
Canned sardines and salmon (with bones)	Calcium
Fatty varieties such as salmon, mackerel, tuna and sardines	Vitamin D
Fruits and vegetables	
Collard greens, turnip greens, kale, okra, Chinese cabbage, dandelion greens, mustard greens and broccoli.	Calcium
Spinach, beet greens, okra, tomato products, artichokes, plantains, potatoes, sweet potatoes, collard greens and raisins.	Magnesium
Tomato products, raisins, potatoes, spinach, sweet potatoes, papaya, oranges, orange juice, bananas, plantains and prunes.	Potassium
Red peppers, green peppers, oranges, grapefruits, broccoli, strawberries, brussels sprouts, papaya and pineapples.	Vitamin C
Dark green leafy vegetables such as kale, collard greens, spinach, mustard greens, turnip greens and brussel sprouts.	Vitamin K
Fortified Foods	
Calcium and vitamin D are sometimes added to certain brands of juices, breakfast foods, soy milk, rice milk, cereals, snacks and breads.	Calcium, Vitamin D

Source:
https://www.nof.org/patients/treatment/nutrition

Common Medical Concerns with Aging

Most prevalent chronic diseases in older (65+) Canadians:

7. Cancer
   - High simple (free) sugar, high-fat (leading to being overweight), high red/cured meat consumption, higher than moderate alcohol intake



Source: https://www.cancer.org/treatment/survivorship-during-and-after-treatment/staying-active/nutrition.html

Common Medical Concerns with Aging

Most prevalent chronic diseases in older (65+) Canadians:

8. COPD

- **Choose complex carbohydrates**, such as whole-grain bread and pasta, fresh fruits and vegetables.
  - *To lose weight*: Opt for fresh fruits and veggies over bread and pasta for the majority of your complex carbohydrates.
  - *To gain weight:* Eat a variety of whole-grain carbohydrates and fresh fruits and vegetables.
- **Limit simple carbohydrates**, including table sugar, candy, cake and regular soft drinks.
- **Eat 20 to 30 grams of fiber each day**, from items such as bread, pasta, nuts, seeds, fruits and vegetables.
- **Eat a good source of protein** at least twice a day to help maintain strong respiratory muscles. Good choices include milk, eggs, cheese, meat, fish, poultry, nuts and dried beans or peas.
  - *To lose weight*: Choose low-fat sources of protein such as lean meats and low-fat dairy products.
  - *To gain weight*: Choose protein with a higher fat content, such as whole milk, whole milk cheese and yogurt.
- **Choose mono- and poly-unsaturated fats**, which do not contain cholesterol. These are fats that are often liquid at room temperature and come from plant sources, such as canola, safflower and corn oils.
  - *To lose weight*: Limit your intake of these fats.
  - *To gain weight*: Add these types of fats to your meals.
- **Limit foods that contain trans fats and saturated fat.** For example, butter, lard, fat and skin from meat, hydrogenated vegetable oils, shortening, fried foods, cookies, crackers and pastries.

Source: https://www.lung.org/lung-health-diseases/lung-disease-lookup/copd/living-with-copd/nutrition

Common Medical Concerns with Aging

Most prevalent chronic diseases in older (65+) Canadians:

9. Asthma

What can help?

- Vitamin D to reduce inflammation and improve immune function
  - Milk/yogurt, salmon, eggs
- Vitamin E reduces symptoms of coughing and wheezing
  - Almonds, hazelnuts, seeds, chard, spinach, brassicas

What to avoid?

- Sulfites can worsen symptoms in some people
  - Dried fruits, some pickled food, shrimp, maraschino cherries, bottled lemon or lime juices, and alcohol
- Salicylates are naturally occurring chemical compounds and, although it's rare, some people with asthma may be sensitive to salicylates found in tea, coffee, some herbs or spices and even aspirin.

Source: https://www.lung.org/blog/asthma-and-nutrition

Common Medical Concerns with Aging

Most prevalent chronic diseases in older (65+) Canadians:

10. Mood & Anxiety disorders

Diet & exercise can help to manage symptoms

- Water consumption to stay hydrated
- Limiting or avoiding alcohol and caffeine
- Limiting simple (free) sugar intake
- Focus on fiber intake (whole grains, vegetables & fruits)
- Regular meal consumption (don't skip meals)

Helps to maintain consistent blood glucose (sugar) and therefore brain & other function

Source: https://www.health.harvard.edu/blog/nutritional-strategies-to-ease-anxiety-201604139441

Farm to Table: the philosophy

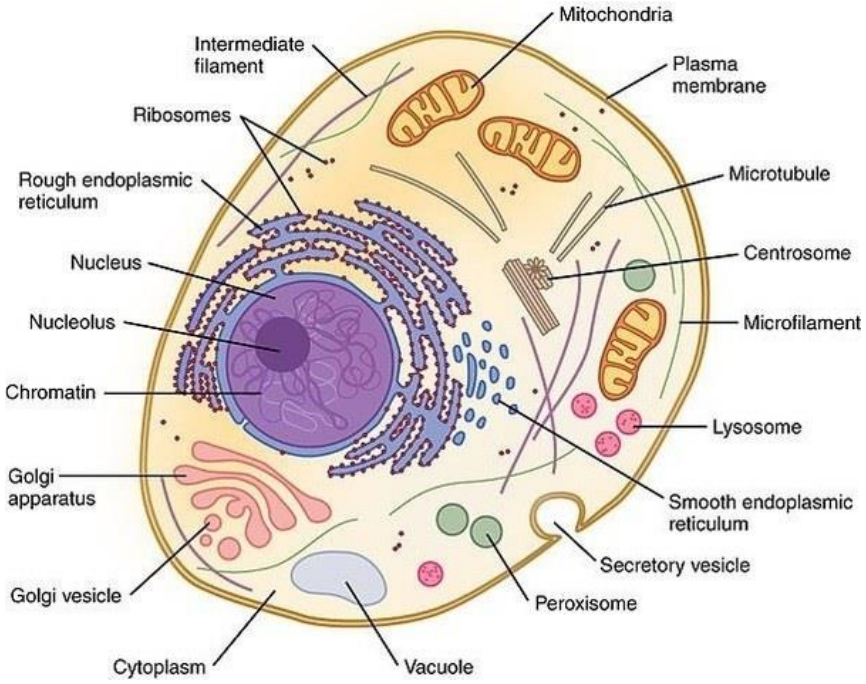
Connecting to *where* you live and *when* you're living

Interaction between between the local *farmers* and the *people* eating the food

Farm to Table & Food to Human Cells

Nutrients are directly related to cell function, so some questions to ask:

1. *What* do I eat?
2. *Where* did it come from?
3. *How was it prepared?*



Processed Foods – *Why you want to eat at home*

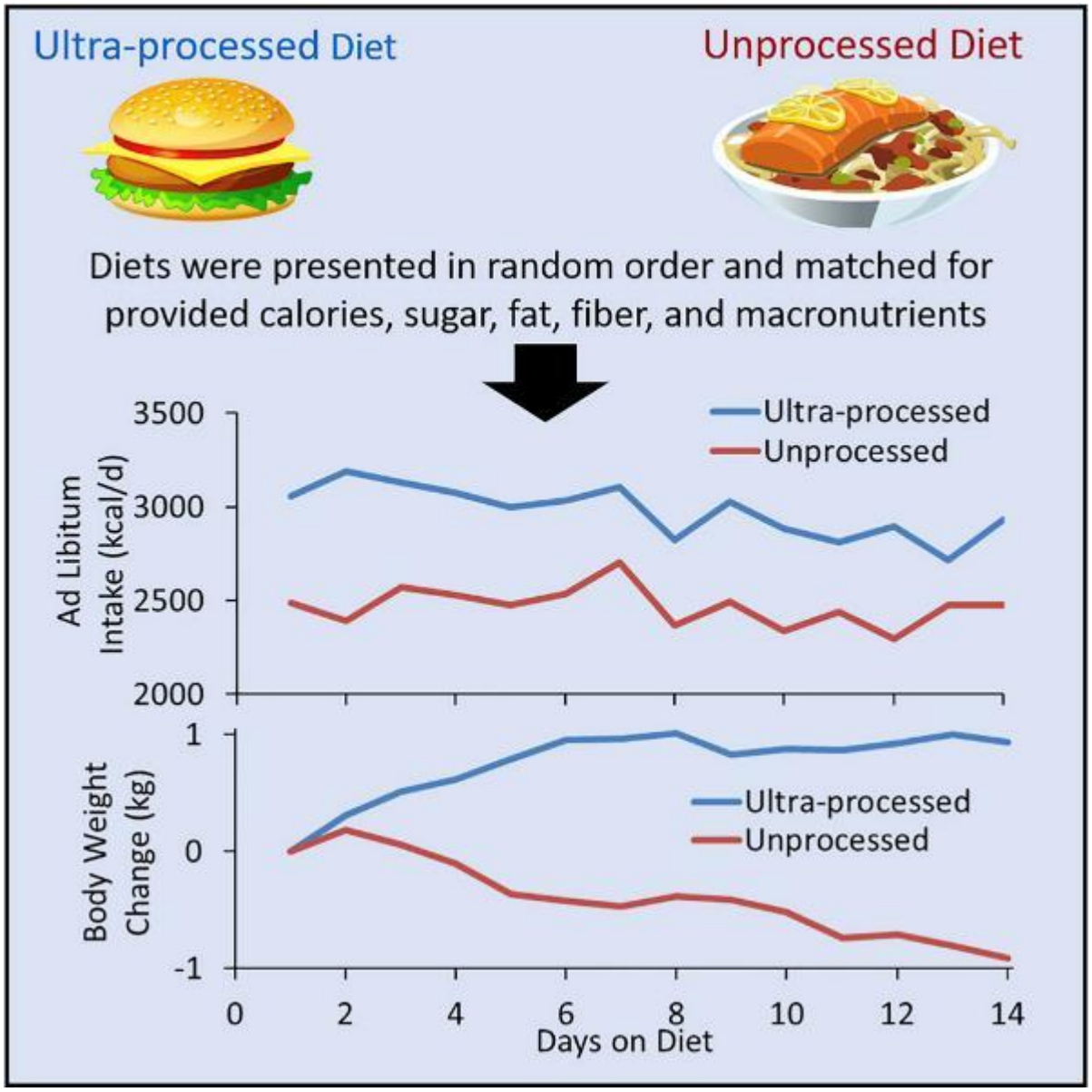


Image from Hall et al. May 2019 (NIH obesity research centre in MD USA)
https://www.sciencedirect.com/science/article/pii/S1550413119302487

Sourcing Foods Close to Home Limits Exposure to Possible Contaminants

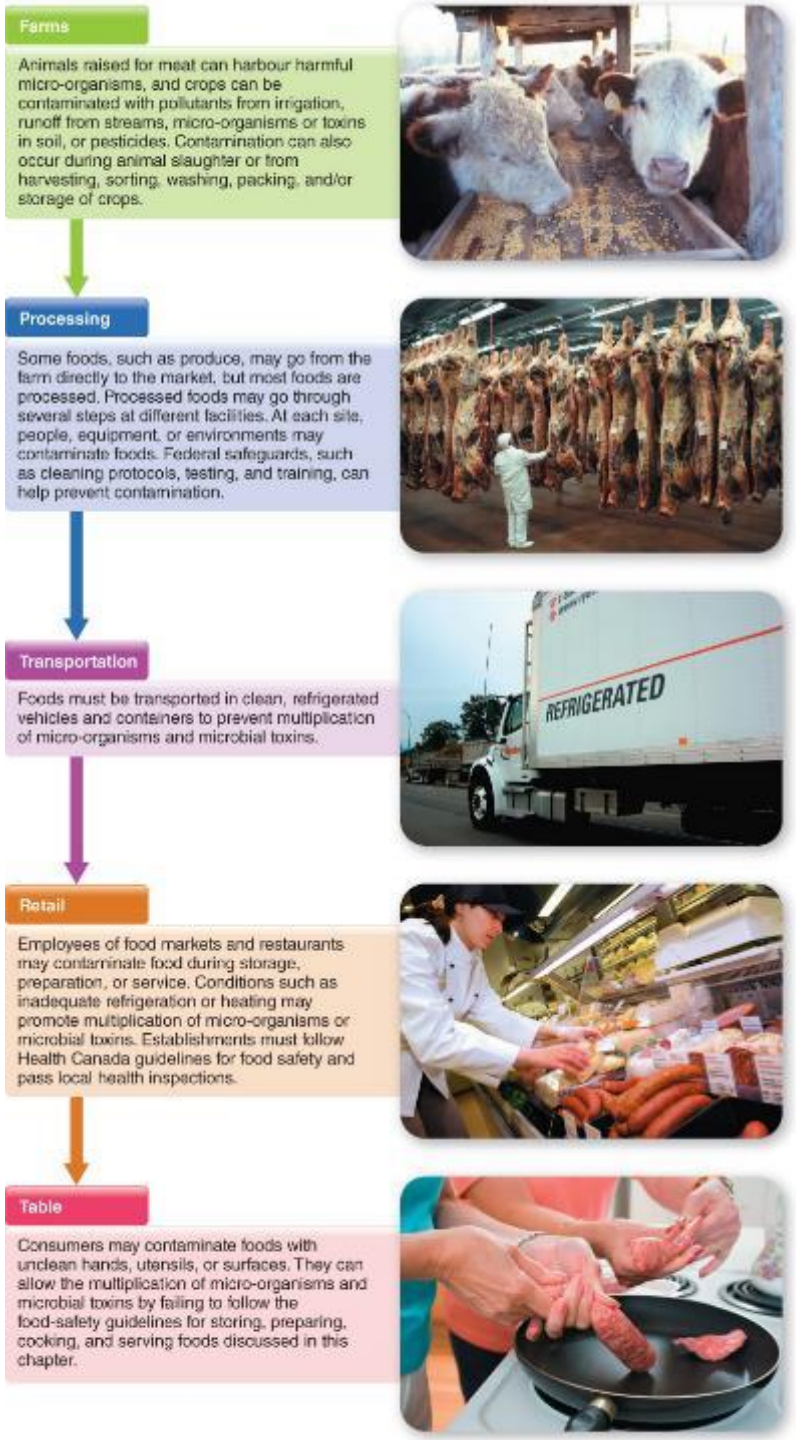


Figure 13.1 Food is at risk for contamination at any of the five stages from farm to table, but following food-safety guidelines can reduce the risks.

Source: (Data from Iowa State University Extension, Food Safety and Quality Project. 2003. Safe Food: It's Your Job Too! www.extension.iastate.edu/foodsafety/Lesson/?CFID=25874608&CFTOKEN=69223455. U.S. Food and Drug Administration (FDA). How Can I Prevent Foodborne Illness? www.fda.gov/~dms/qa-topfd.html; and Centers for Disease Control and Prevention (CDC), Division of Bacterial and Mycotic Diseases, Disease Information, Foodborne Illness. www.cdc.gov/ncidod/dbmd/diseaseinfo/foodborneinfections_g.htm.)

Pesticides

Pesticides are used to help protect against *crop losses*, *reduce the incidence of crop disease*, and *increase crop yields*

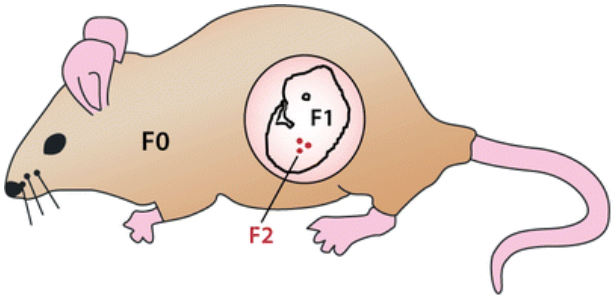
- Common pesticides are *insecticides*, *herbicides*, and *fungicides*
- Can be *natural* or *synthetic*
- Can *remain* as toxins on foods

- Regulated by: Health Canada's Pest Management Regulatory Agency

Pesticides

Some pesticides mostly *don't wash off:*

- *Vinclozolin*
- *Bifenthrin*
- *Chlorpyrifios*



Youngson NA, Whitelaw E. 2008.
Annu. Rev. Genomics Hum. Genet. 9:233–57

Some show *transgenerational mutagenic effects*

'Fruit & Veggie' washing agents or vinegar might slightly increase cleaning, but not by much:

~ same as scrubbing with water

US EPA, 2016

Organic Foods

Organic foods are grown without the use of *synthetic* pesticides

- *Organic Products Regulations* were put into place in 2009 in Canada
- Approximately 1.7% of all farms in Canada are certified organic farms

CFIA, 2016

Organic Foods

"Organic"

- 95% of ingredients are organic

"Made with organic ingredients"

- 70% or more of ingredients are organic

95% of the ingredients must be organic

70% of the ingredients must be organic

USDA, 2016

Pesticides & Organic Foods

Do you wash your fruits & vegetables?

- Depending on the specific pesticide only some, if any, will rinse off.

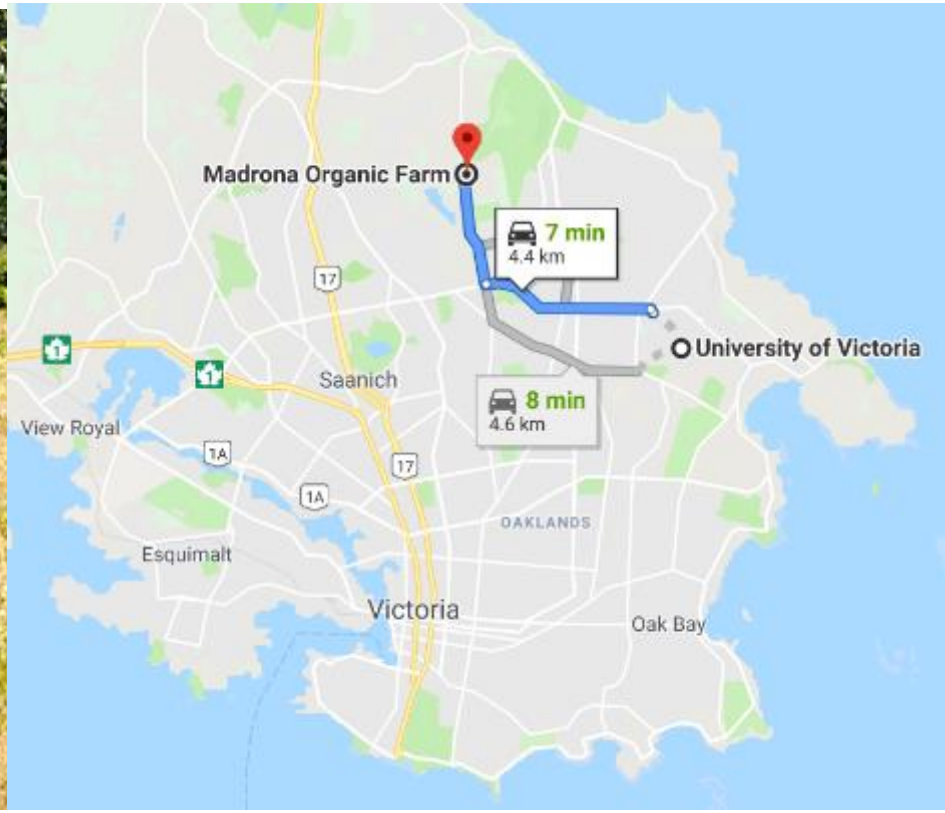
Related video:
http://www.cbc.ca/news/canada/manitoba/pesticide-residue-found-on-nearly-half-of-organic-produce-1.2487712

- What about ***organic***?
  - Philosophy of not using pesticides
  - According to the Canadian Food Inspection Agency (CFIA) in 2014:

    ~½ contain pesticide residue

CFIA, 2016
Photo by Andrew Hendrickson

Madrona Farm – Saanich BC



Locally Foraged Foods

From Instagram of

Lance Staples:

local food forager

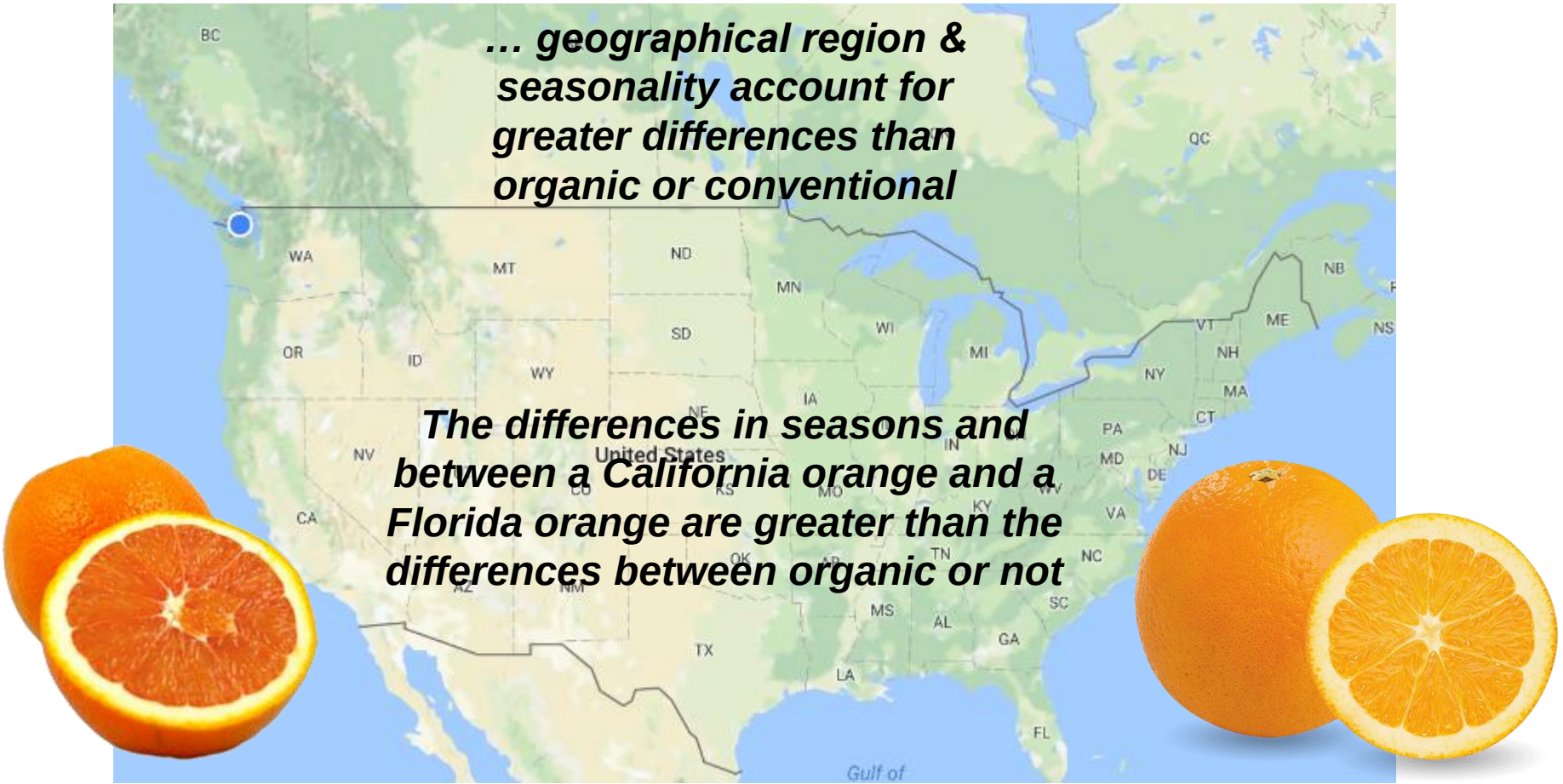
@lancewildcraft

"The lemon leaves of Wood Sorrel. One of my favorites in the spring."

"8 species, 1 non-native: Himalayan blackberry (☺), Thimbleberry, Wild Blueberry, Blackcap raspberry, Trailing Blackberry, Gummy Gooseberry, Red Huckleberry, and Salal Berry."

Are Organic foods more nutrient rich?

- some fruits & vegetables *may* contain higher
  - vitamins E & C, phosphorus, antioxidant phytochemicals, but …



Are **Organic** foods healthier for you?

A 2012 review of 240 studies from 1966-2011:

- No clinically significant ***nutrient*** differences
- Less ***pesticide*** exposure
- Same ***E. coli*** & ***bacterial*** contamination risk
- Conventional meats have 33% higher risk for ***antibiotic resistant bacteria***
- "*The published literature lacks strong evidence that organic foods are significantly more* ***nutritious*** *than conventional foods."* (Smith-Spangler et al, 2012)

You might still decide to eat organic for:

1. *Less pesticide exposure*
2. *Cleaner meat*
3. *Ecological footprint*
4. *Flavour (phytochemical differences)*

Despite the risks & challenges, why the focus on plants?

1. *Fiber*
2. *Vitamins & Minerals*
3. *Displacement of calorie-dense foods*
4. *Phytochemicals*

Canada's Food Guide – January 2019
https://food-guide.canada.ca

Phytochemicals (*phyto* = plant)

Naturally occurring chemicals in ***plants***

Biologically ***active*** in the body

Generally ***better absorption*** in whole foods

Most people consuming a western diet do not consume enough ***plants***

People that eat more ***plants*** *live longer* & have *less disease* (heart disease & cancer)

Phytochemicals give foods their ***unique flavours***

Thompson et al., 2014; Conner et al., 2017

Phytochemicals (*phyto* = plant)

Phytochemicals give foods their ***unique flavours***

e.g. in celery, the bitter-tasting phytochemical *furanocoumarin*

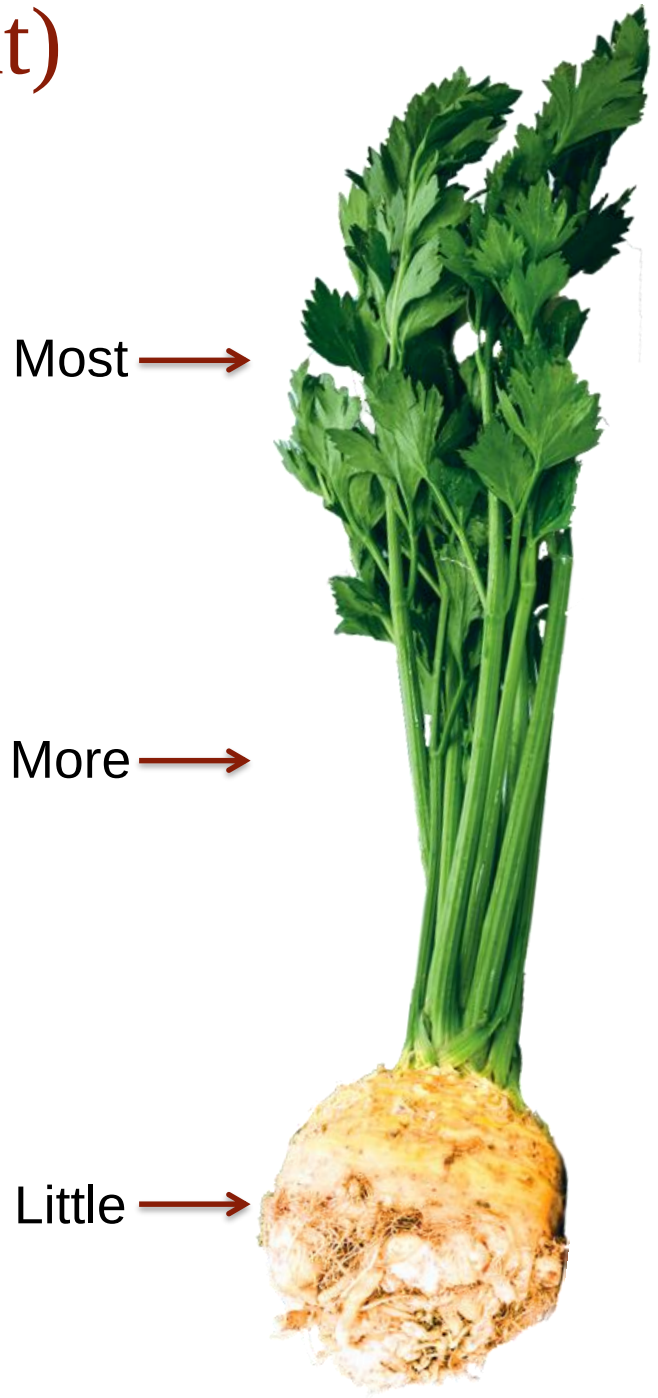


Table 2-1 Some Phytochemical Compounds Under Study

Phytochemical	Food Sources
Allyl sulfides/organosulfurs	Garlic, onions, leeks
Saponins	Garlic, onions, licorice, legumes
Carotenoids (e.g. lycopene)	Orange, red, yellow fruits and vegetables (egg yolks are a source as well)
Monoterpenes	Oranges, lemons, grapefruit
Capsaicin	Chili peppers
Lignans	Flaxseed, berries, whole grains
Indoles	Cruciferous vegetables (broccoli, cabbage, kale)
Isothiocyanates	Cruciferous vegetables, especially broccoli
Phytosterols	Soybeans, other legumes, cucumbers, other fruits and vegetables
Flavonoids	Citrus fruit, onions, apples, grapes, red wine, tea, chocolate, tomatoes
Isoflavones	Soybeans, other legumes
Catechins	Tea
Ellagic acid	Strawberries, raspberries, grapes, apples, bananas, nuts
Anthocyanosides	Red, blue, and purple plants (eggplant, blueberries)
Fructooligosaccharides	Onions, bananas, oranges (small amounts)
Resveratrol	Grapes, peanuts, red wine

Some related compounds under study are found in animal products, such as sphingolipids (meat and dairy products) and conjugated linoleic acid (meat and cheese). These are not phytochemicals per se because they are not from plant sources, but they have been shown to have health benefits.

Farm to Table & Food to Human Cells

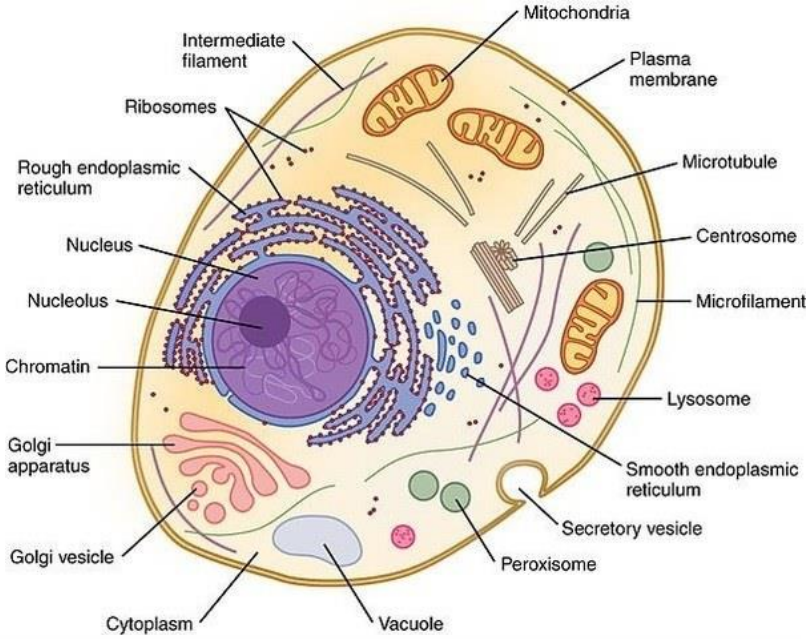
Your body is made of cells; trillions.

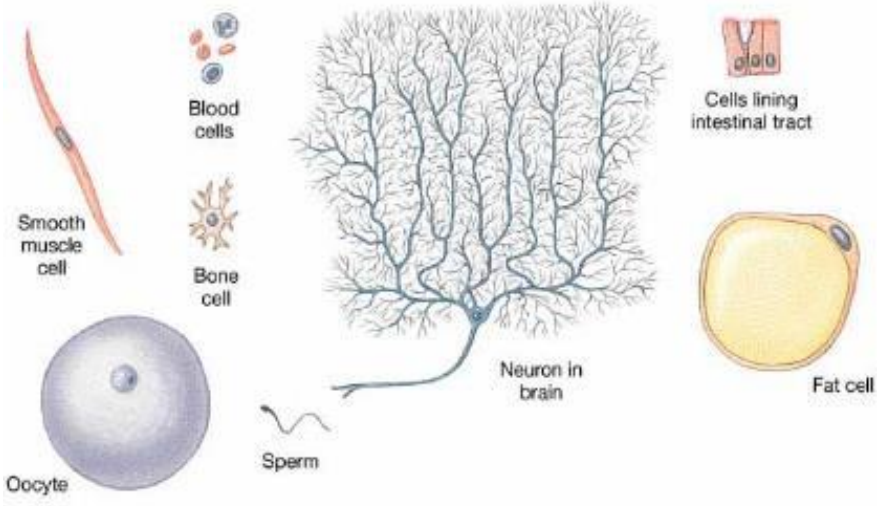
Cells are the basic building blocks for tissues.

Specialized tissues make up organs.

Cells become damaged and need to be repaired.

Nutrients provide the energy and materials for repair and growth.





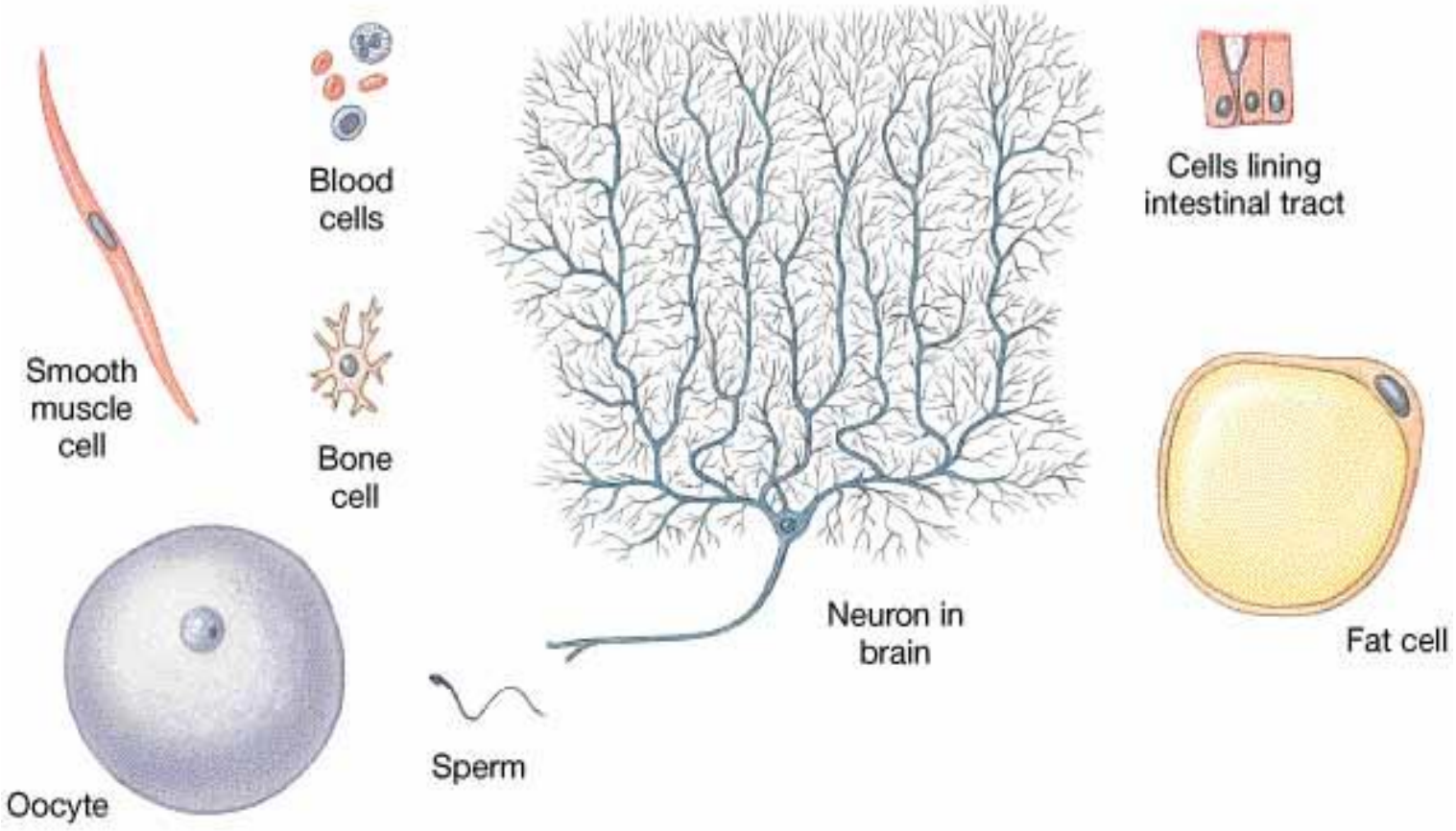
Food to Human Cells: the concept

Human cells make-up *all tissues* of the body

Cells are *damaged* by free-radicals & other mechanisms

Cells are *repaired* or *replaced* on an ongoing basis

Nutrients provide the *energy* and *materials* for repair and growth.



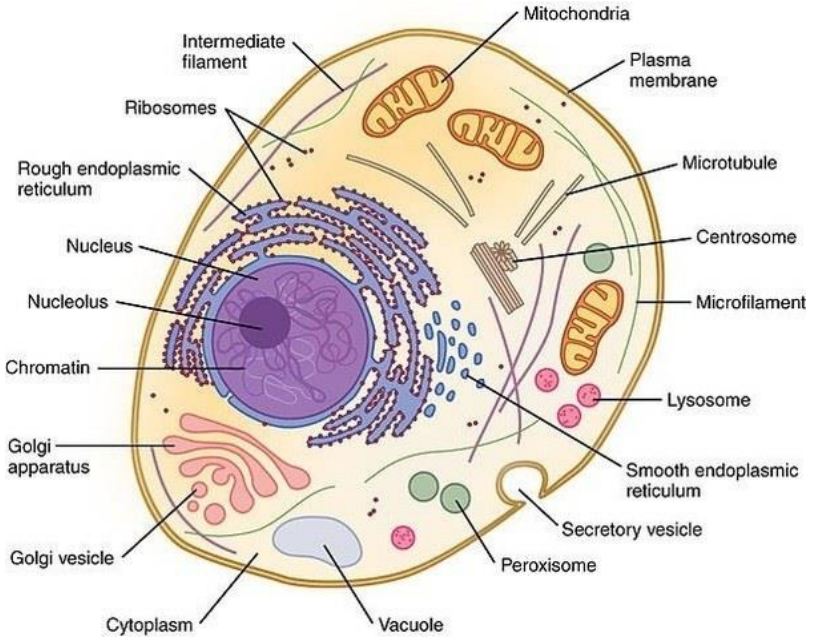
Nature & Nurture

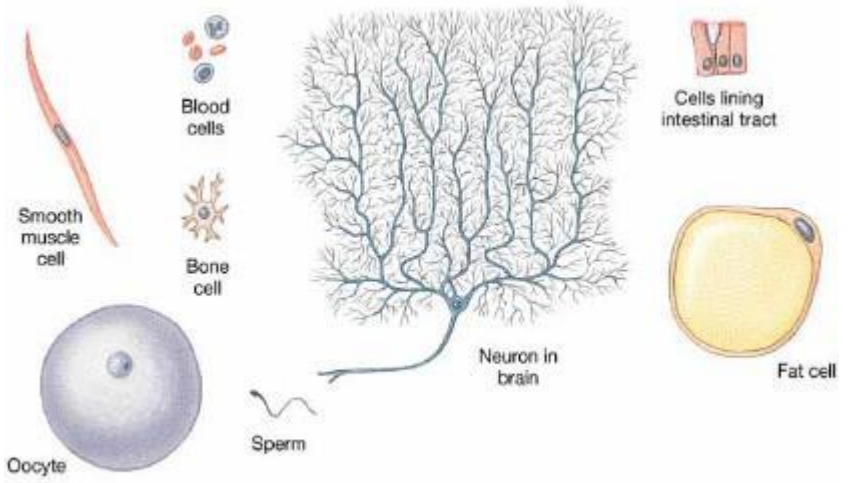
Foods you eat alter the function of your cells.

Exercise alters the function of your cells

Nearly 40 trillion cells of 200 types in your body.

All cells are influenced by *nutrients* & *exercise*.



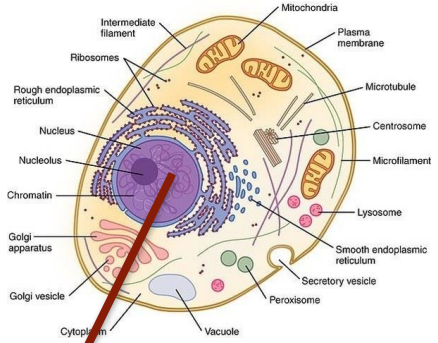


Nature & Nurture

Many inter-individual differences are attributable to genetics.

Your DNA holds the 'blue prints' for making any structure you need to live

- This is how cells are *repaired* and *replaced* every day.



Your *environment*, or 'Nurture', determines how those genes are expressed

- i.e. the types and amounts of proteins built by your cells.

Food is part of your *environment*.

Nutrients for Critical Cell Functions

Vitamins & *Minerals* from plants

Omega fats from fish & flax/chia/etc

Phytochemicals in richly coloured plants

- e.g.
  - *Glucosinolates* in brassicas plants
  - *Lycopene* in tomatoes
  - *Resveratrol* in grapes/wine/berries
  - + *thousands more*

What does this look like on a whole diet level?

Nutrients Used by Your Brain

What is your brain made of?

By *weight*, most of your brain is:

1. Fats

Image from - https://www.youtube.com/watch?v=xyQY8a-ng6g

Then:

2. Amino acids
3. Proteins
4. Glucose (blood sugar)
5. Micronutrients (vitamins & minerals, phytochemicals, pharmaceuticals, etc)

Nutrients Used by Your Brain

Omega-3 and Omega-6 fats are critical to brain maintenance by repairing cell walls

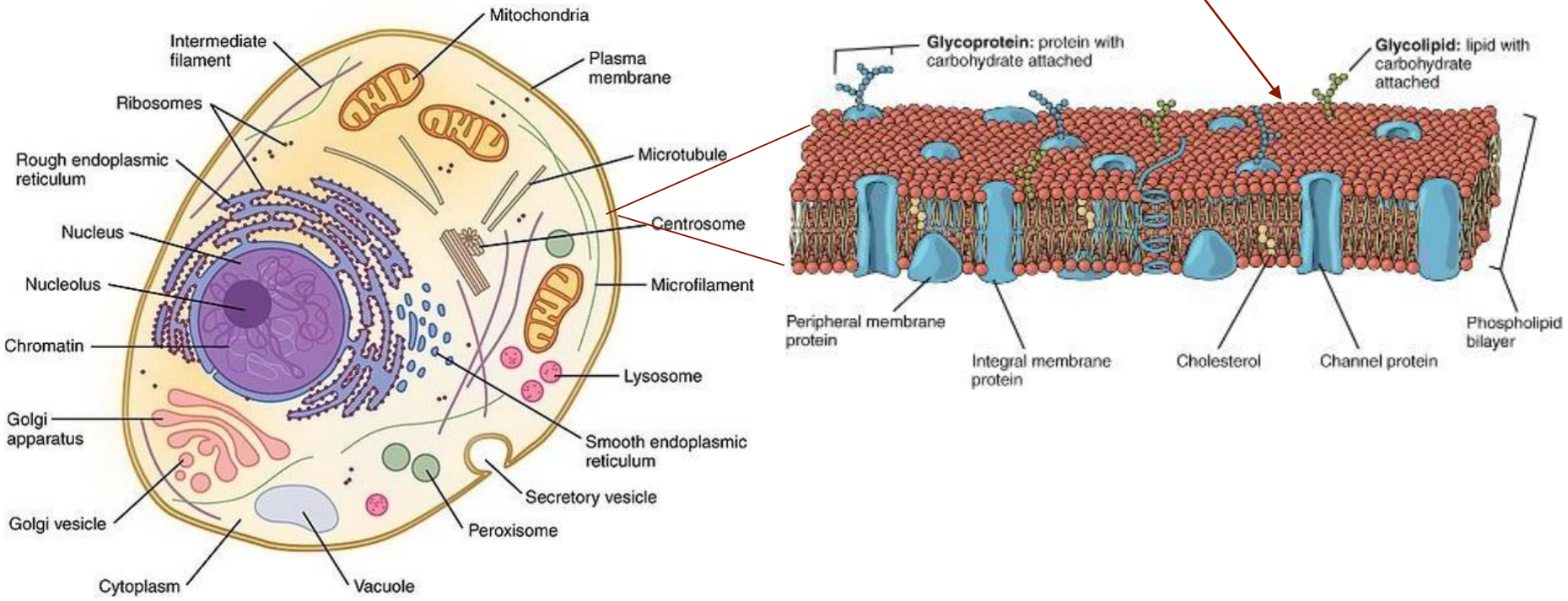


Image from – https://opentextbc.ca/anatomyandphysiology/chapter/3-2-the-cytoplasm-and-cellular-organelles/

Omega-3 (N-3) Fats

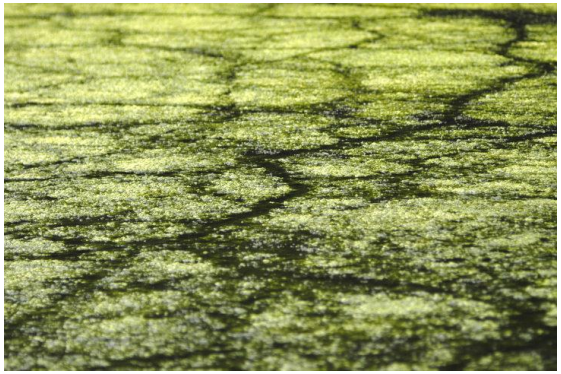
3 types of Omega-3 (N-3)

ALA is present in plant oils, such as:

- flaxseed, soybean, canola oils, chia seeds, walnuts

EPA and *DHA* are present in:

- fish, fish oils, and krill oils
- The fats are originally synthesized by microalgae, not by the fish.
- When fish consume phytoplankton that consumed microalgae, they accumulate the omega-3 in their tissues



NIH 2018

Source verified March 31, 2019:
https://www.canada.ca/en/health-canada/services/food-nutrition/healthy-eating/dietary-reference-intakes/tables/reference-values-macronutrients-dietary-reference-intakes-tables-2005.html

Health Canada AMDRs 2005/2019

Males & Females [34]	Total Carbohydrate Percent of Energy	Total Protein Percent of Energy	Total Fat Percent of Energy	n-6 polyunsaturated fatty acids (linoleic acid) Percent of Energy	n-3 polyunsaturated fatty acids (α-linolenic acid) Percent of Energy [35]
1-3 years	45 - 65 %	5 - 20 %	30 - 40 %	5 - 10 %	0.6 - 1.2 %
4-18 years	45 - 65 %	10 - 30 %	25 - 35 %	5 - 10 %	0.6 - 1.2 %
19 years and over	45 - 65 %	10 - 35 %	20 - 35 %	5 - 10 %	0.6 - 1.2 %

[34] Includes pregnant and lactating women.
[35] Up to 10% of the AMDR can be consumed as eicosapentaenoic acid (EPA) and/or docosahexaenoic acid (DHA).

3 types of Omega-3 (N-3)

- ALA is present in plant oils, such as:
  - flaxseed, soybean, canola oils, chia seeds, walnuts
- EPA and DHA are present in:
  - fish, fish oils, and krill oils

Nutrients ~~Used by~~ Bad for Your Brain

Some fats like *trans-fats* and *large amounts of saturated fats* (from animal meats/products) can compromise brain health

- Earlier cognitive decline
- Higher cardiovascular disease risk
  - i.e. more heart attacks & strokes

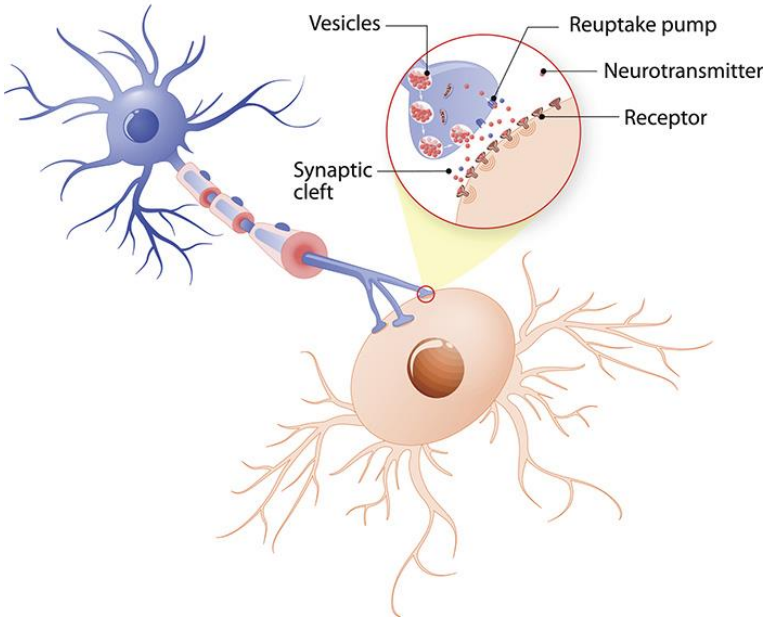
NIH 2018

Nutrients Used by Your Brain

Proteins & amino acids

- Building blocks of neurons in the brain
- Enzymes & hormones that regulate function
  - This can effect how you feel & behave

Nutrients Used by Your Brain

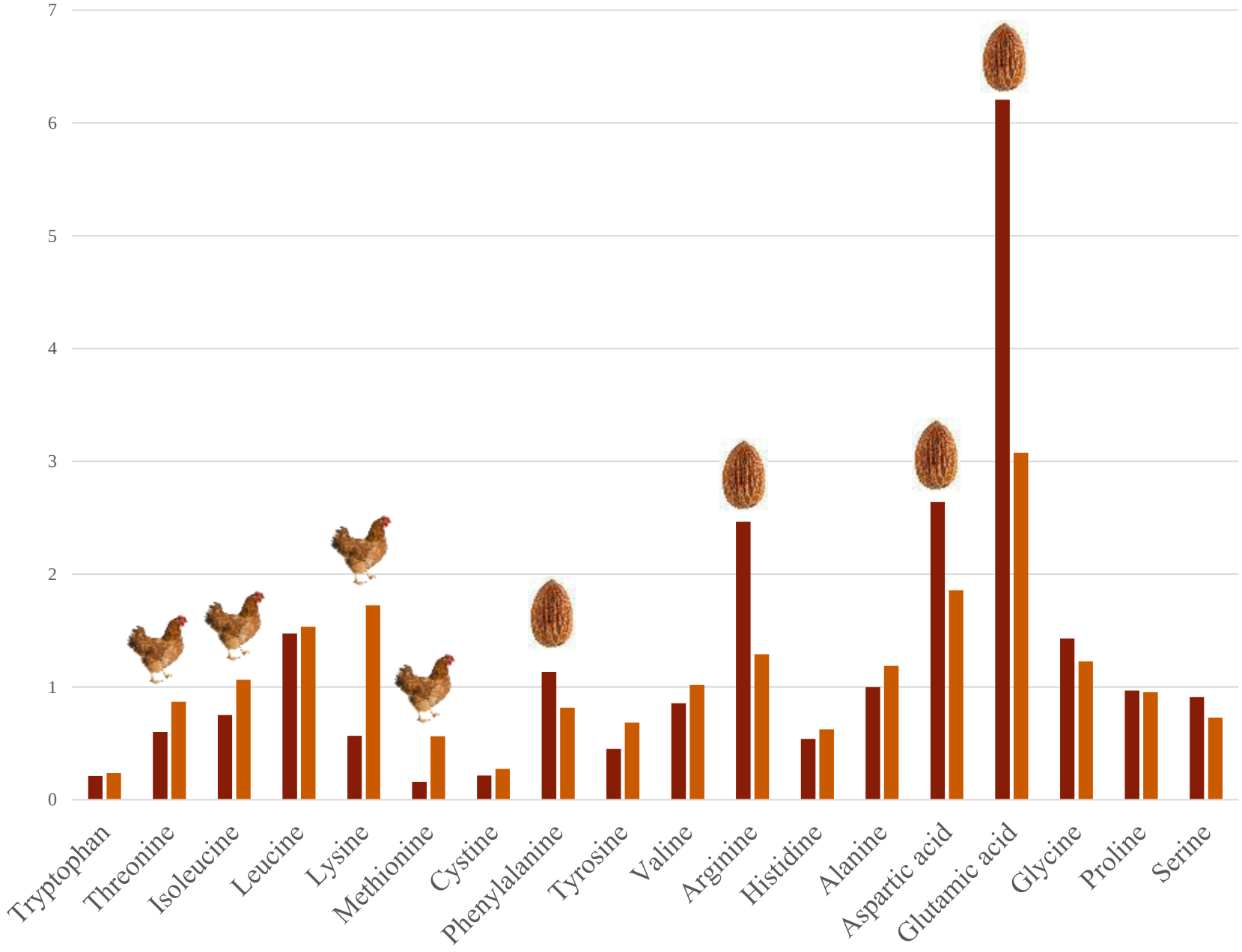


Amino acids

- Precursors to neurotransmitters
  - These are the chemical messengers that relay signals between neurons
  - Affects things like mood, sleep, attentiveness, etc

Variety of food choices maximizes the chances that we get everything we need.

Functional Amino Acid Distributions



Nutrients Used by Your Brain

Vitamins & Minerals

- Prevent cell damage by acting as antioxidants
- For the brain specifically, *vitamins* B6, B12, and folic acid.
  - Diets high in these have less brain diseases and slower cognitive decline.

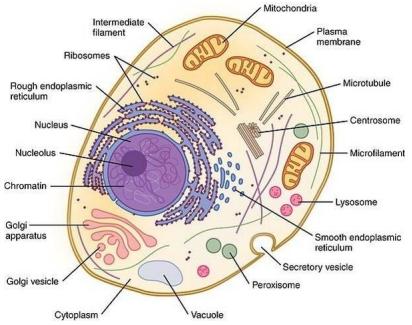
Nutrients Used by Your Brain

Vitamins & Minerals

- Prevent cell damage by acting as antioxidants
- For the brain specifically, *minerals* iron, zinc, copper, sodium
  - Overall brain health and cognitive development is better with higher intakes

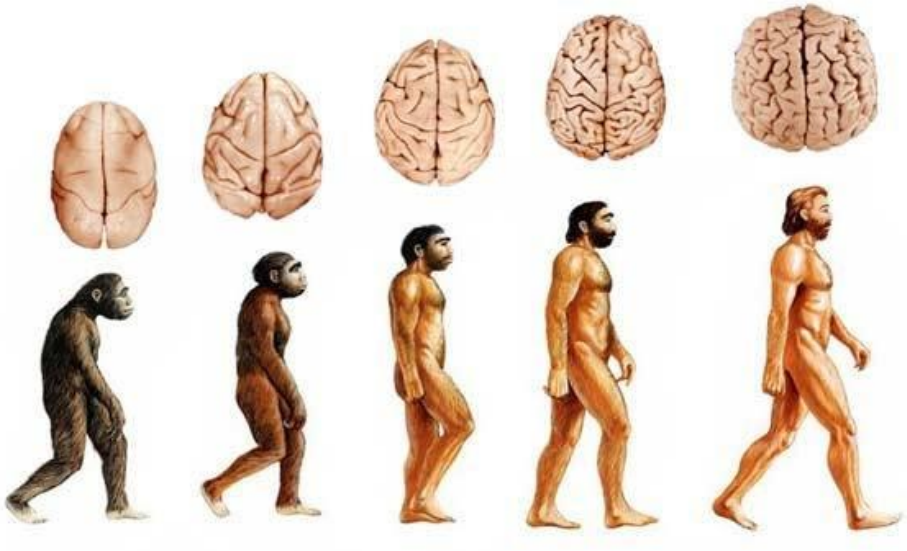
Nutrients Used by Your Brain

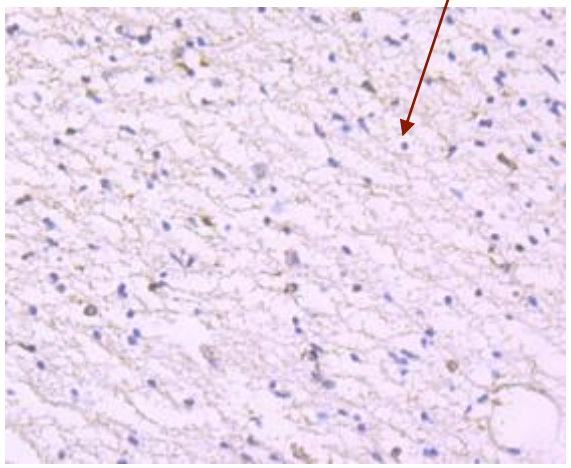
To use of all these nutrients your brain needs its preferred fuel; *glucose* or *"blood sugar"*



Your brain is only about 2% of your body weight but uses about 20% of your nutrients including *glucose*.

Fibrous foods give a slow (hours) release of glucose unlike sugary foods that enter the blood very fast (minutes).





Glucose (darker colour) in brain tissue (lighter colour)

Nutrients Used by Your Muscles

Adults generally lose muscle mass as we age.

Maintaining muscle function is a key to independent living in older adulthood.

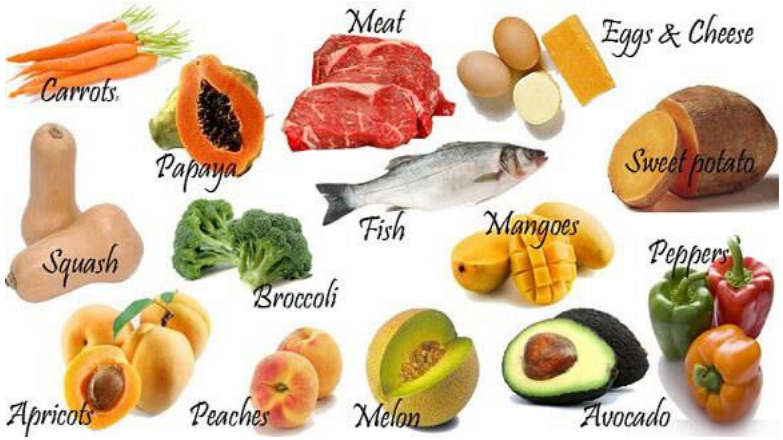
Muscles need three things to grow:

1. Exercise
2. Protein from lean sources
3. Glucose made by your liver from complex carbohydrates (starchs/fibres)
   - Sourced from *whole grains* and *fibrous vegetables/fruits*

Nutrients Used by Your Muscles

Muscles also require vitamins and minerals:

- For antioxidant qualities
- For energy systems
- Iron, vitamin E, B vitamins (B6 & B12)



What's Next?

Presentation 4 (June 22nd): "Dietary Choices: How Your Food Environment Shapes Your Eating"

If you've wondered how your surroundings affect your food choices, then this talk is for you! We will look at strategies used by food vendors to sell you products, and we will look at how you can create home and work settings that lead you to making healthy food choices without even thinking about it.