

# Farm to Table & Food to Human Cells

## *Exploring the Culinary & Nutrition Concepts & Controversies of the Foods We Eat*

~

Wednesday May 22<sup>nd</sup> 2019

Presented by Greg Mulligan

Instructor in the BSc Kinesiology program

University of Victoria

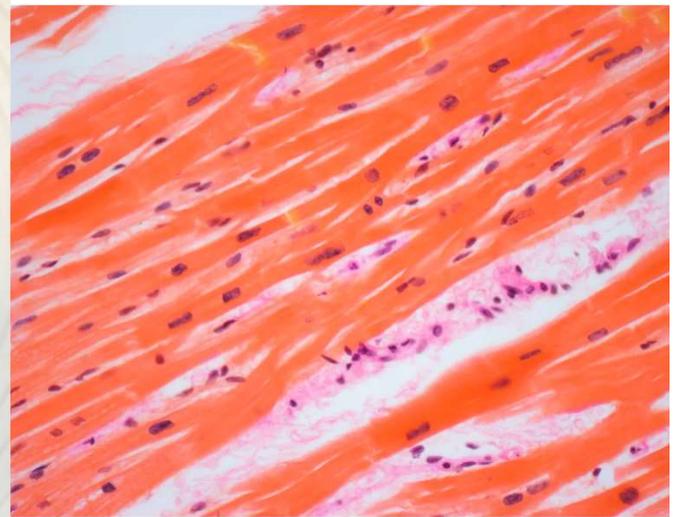
[EatWhereYouLive.org](http://EatWhereYouLive.org)



*Farms in Saanich*



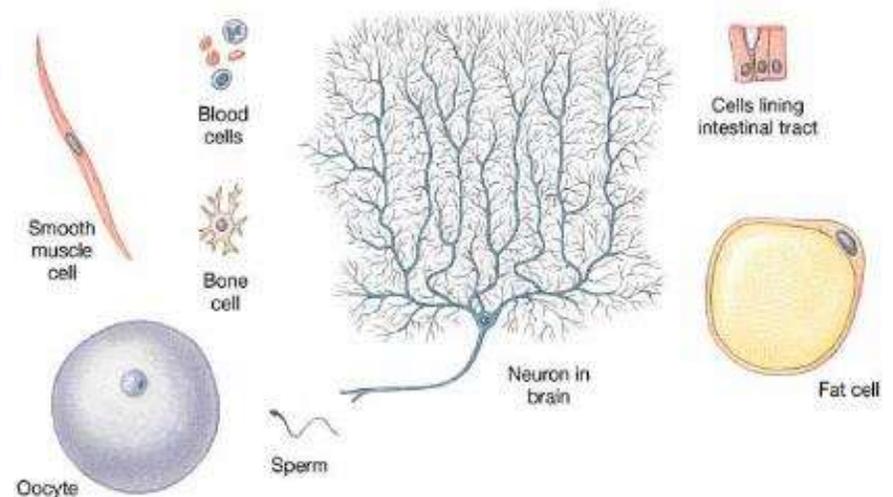
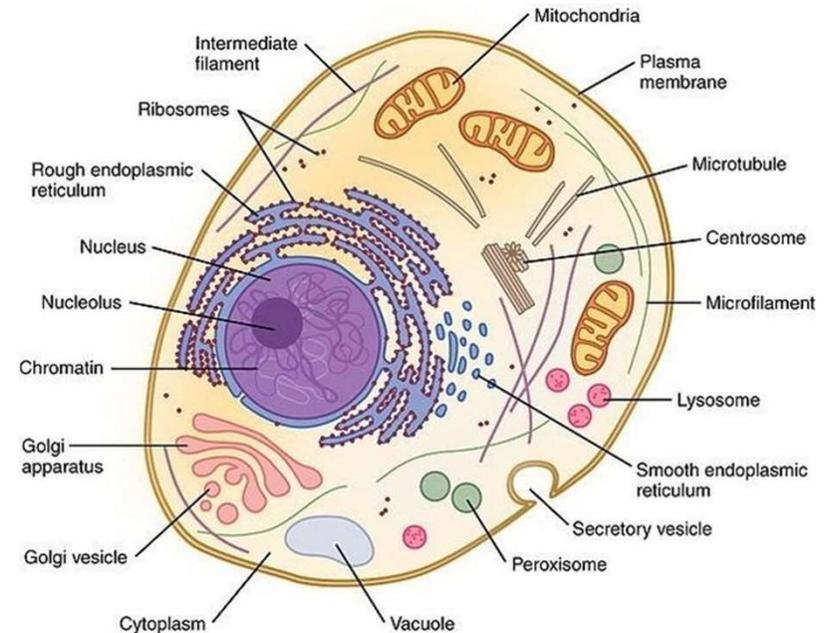
*Food in Victoria*



*Heart muscle cells in you*

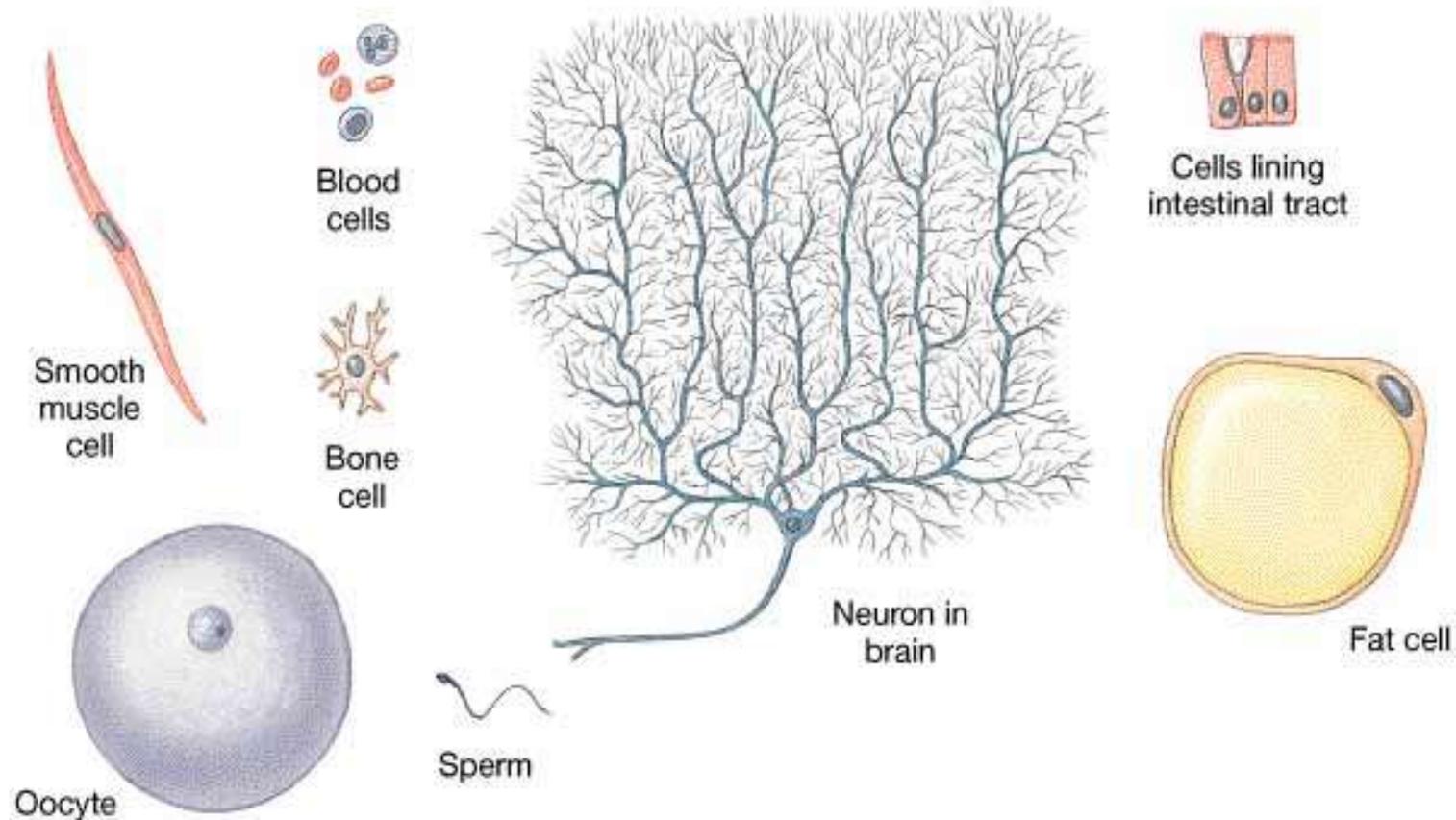
# Farm to Table & Food to Human Cells

- 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.



# Farm to Table: the philosophy

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

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



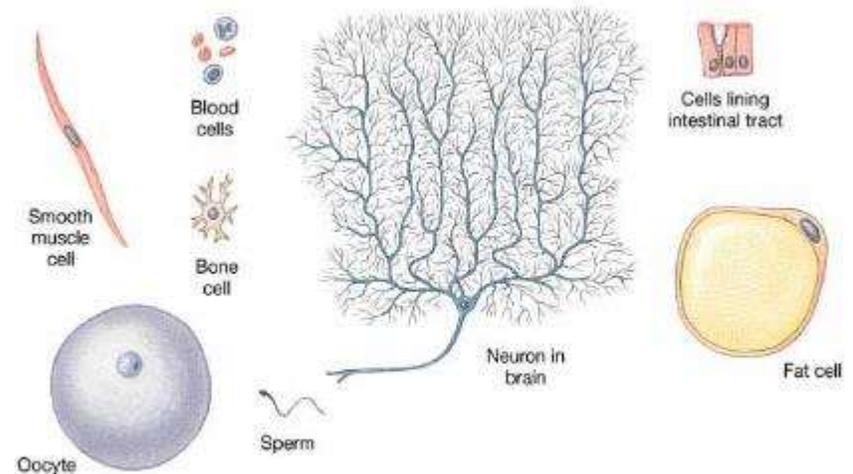
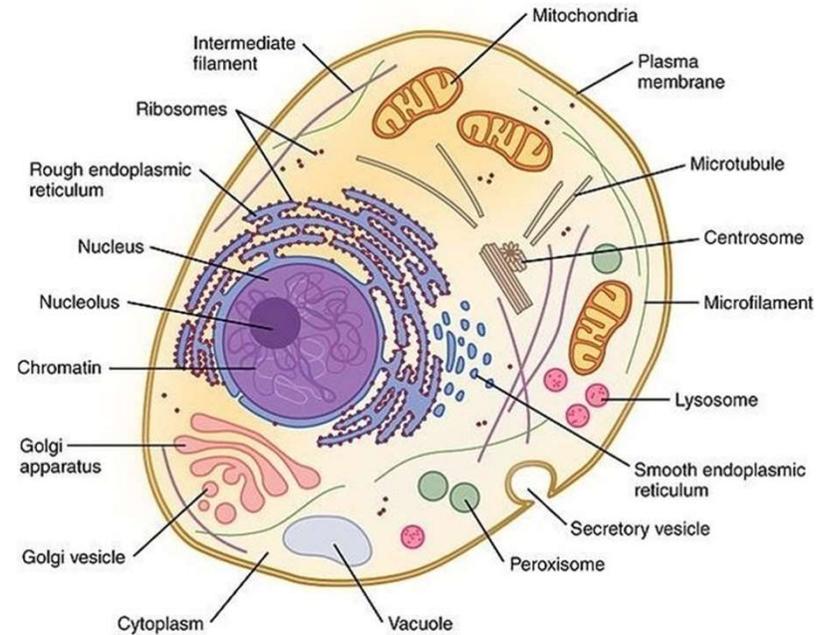
# Nature & Nurture

*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.

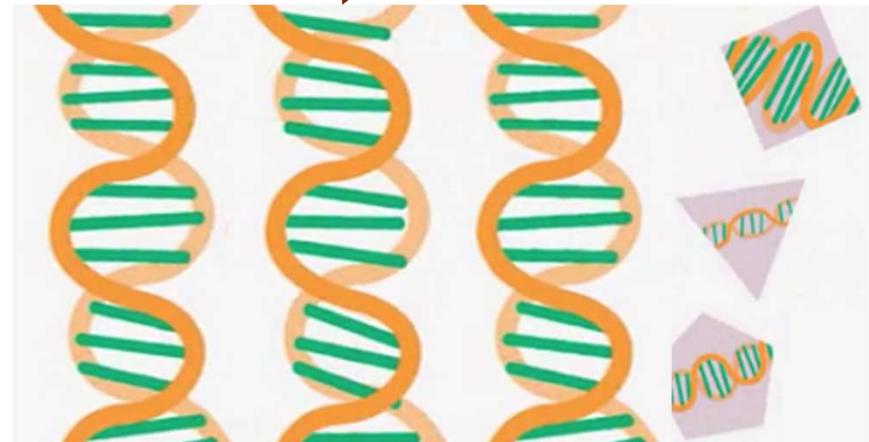
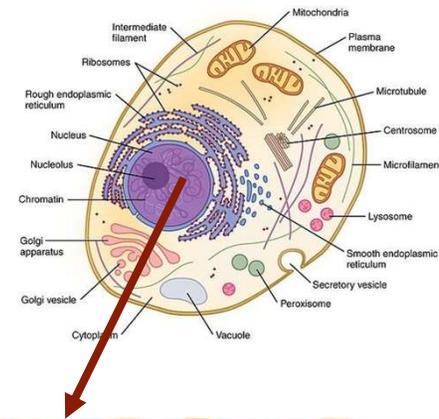
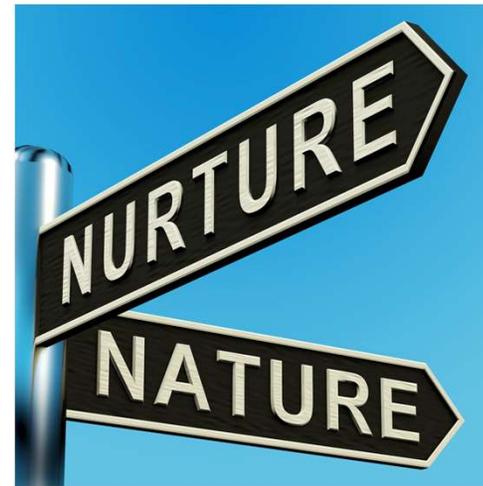
Your DNA holds the ‘blue prints’ for making any structure you need to live

- 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.

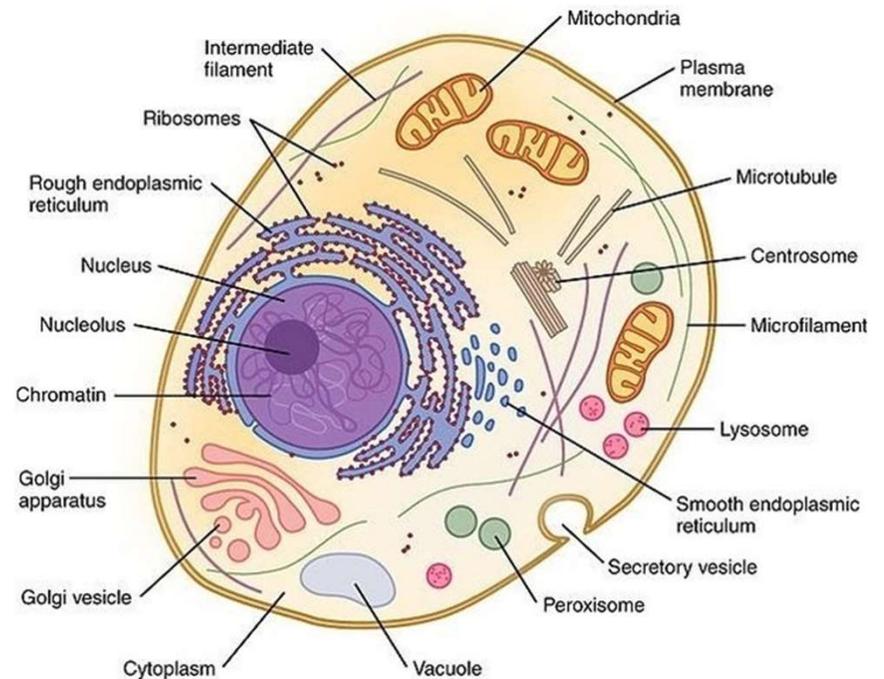
*Food* is part of your *environment*.



# 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. *When do I eat it?*
3. *Where did it come from?*



# 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

Then:

2. Amino acids

3. Proteins

4. Glucose (blood sugar)

5. Micronutrients (vitamins & minerals, phytochemicals, pharmaceuticals, etc)

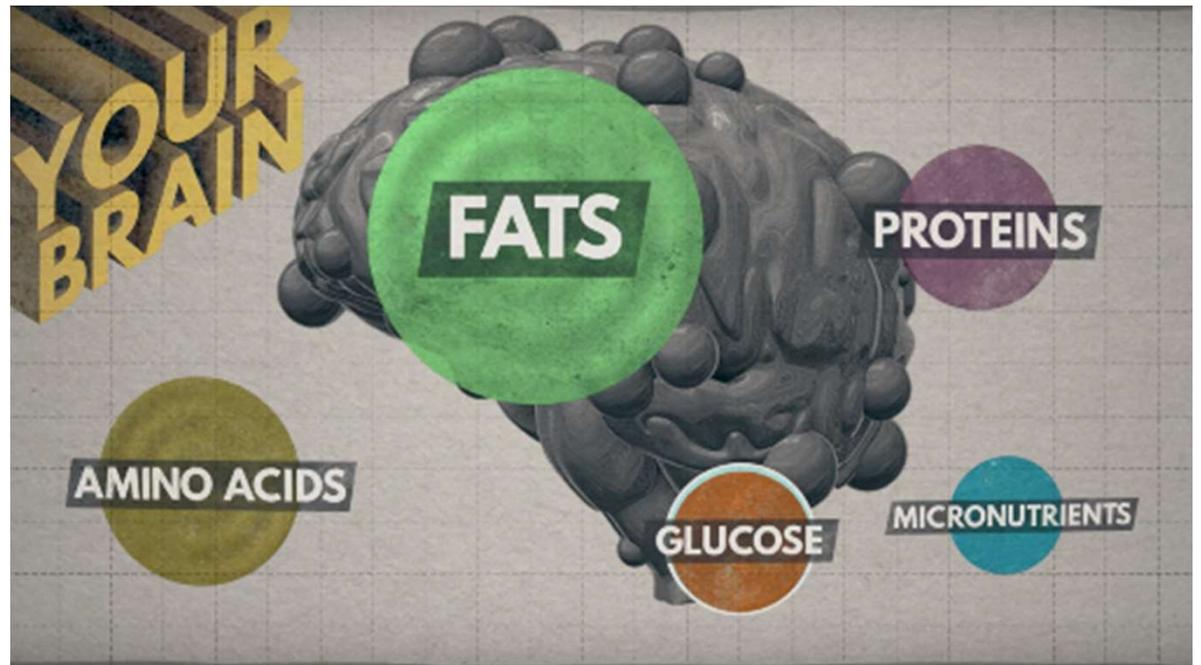


Image from - <https://www.youtube.com/watch?v=xyQY8a-ng6g>

# Nutrients Used by Your Brain

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

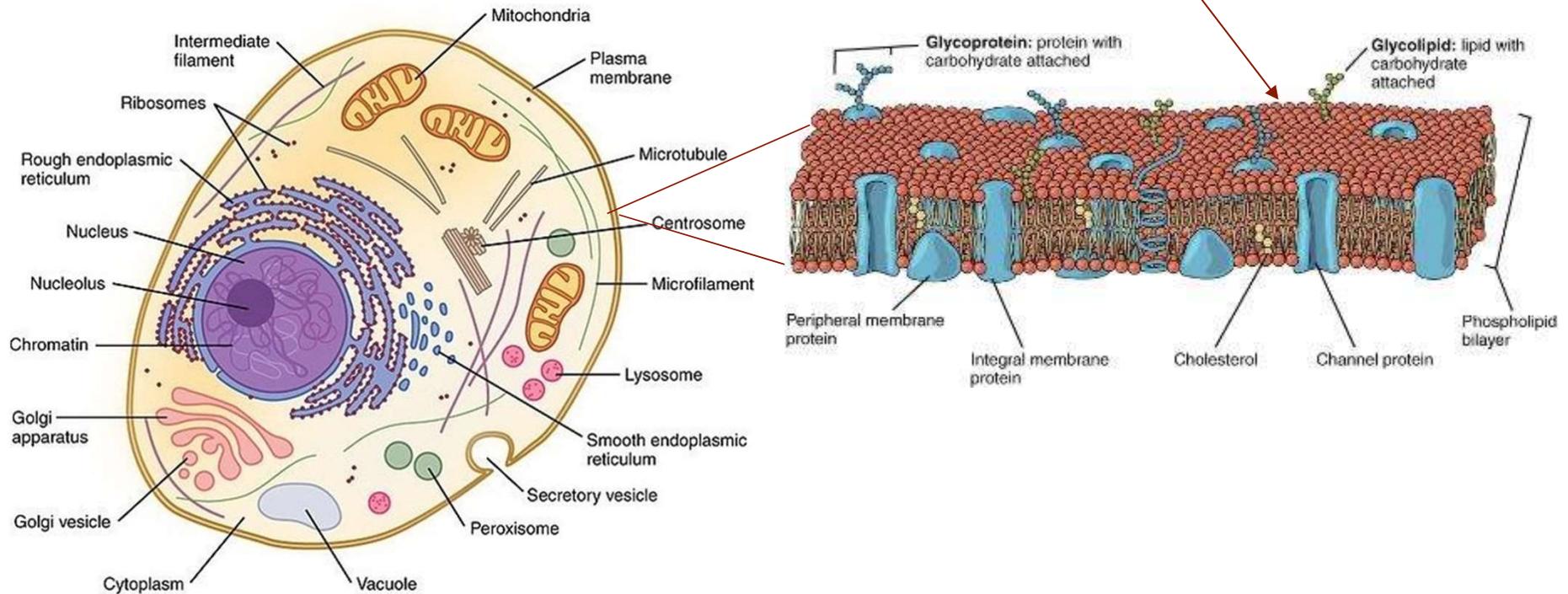


Image from – <https://opentextbc.ca/anatomyandphysiology/chapter/3-2-the-cytoplasm-and-cellular-organelles/>

# Omega-3 (N-3) Fats

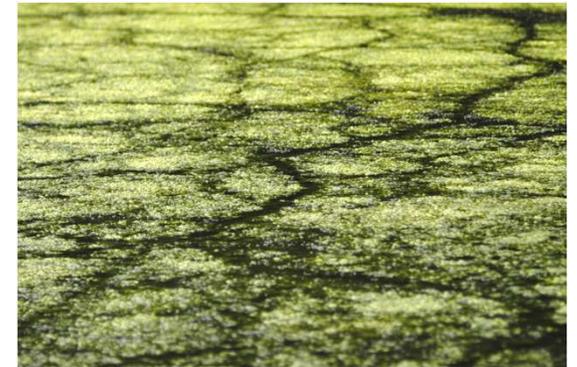
3 types of Omega-3 (N-3)

*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



# 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

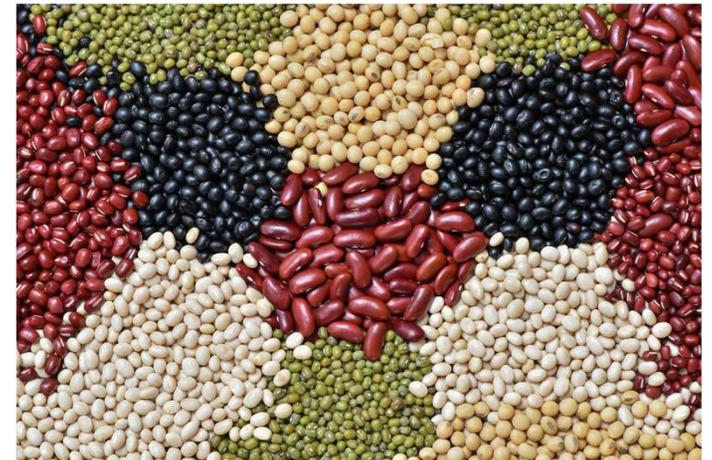
- Earlier cognitive decline
- Higher cardiovascular disease risk
  - i.e. more heart attacks & strokes



# 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

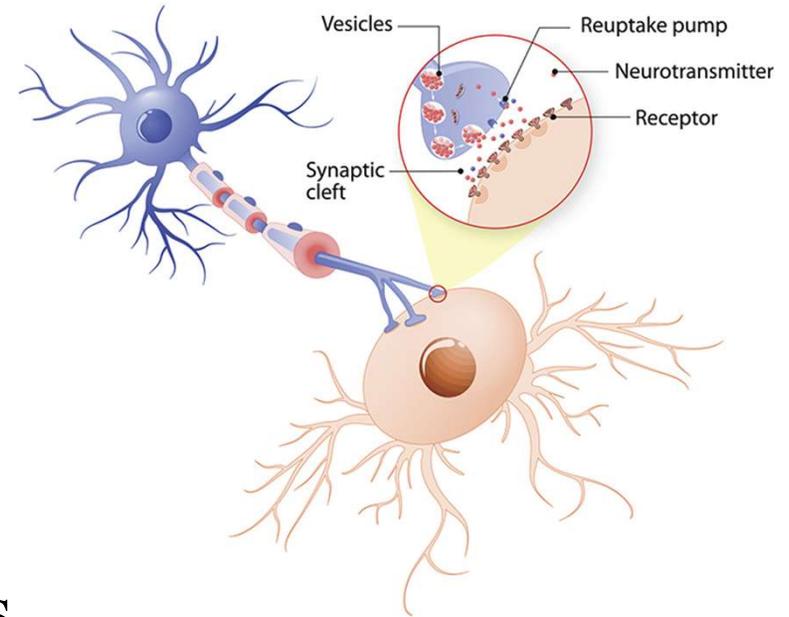


# Nutrients Used by Your Brain

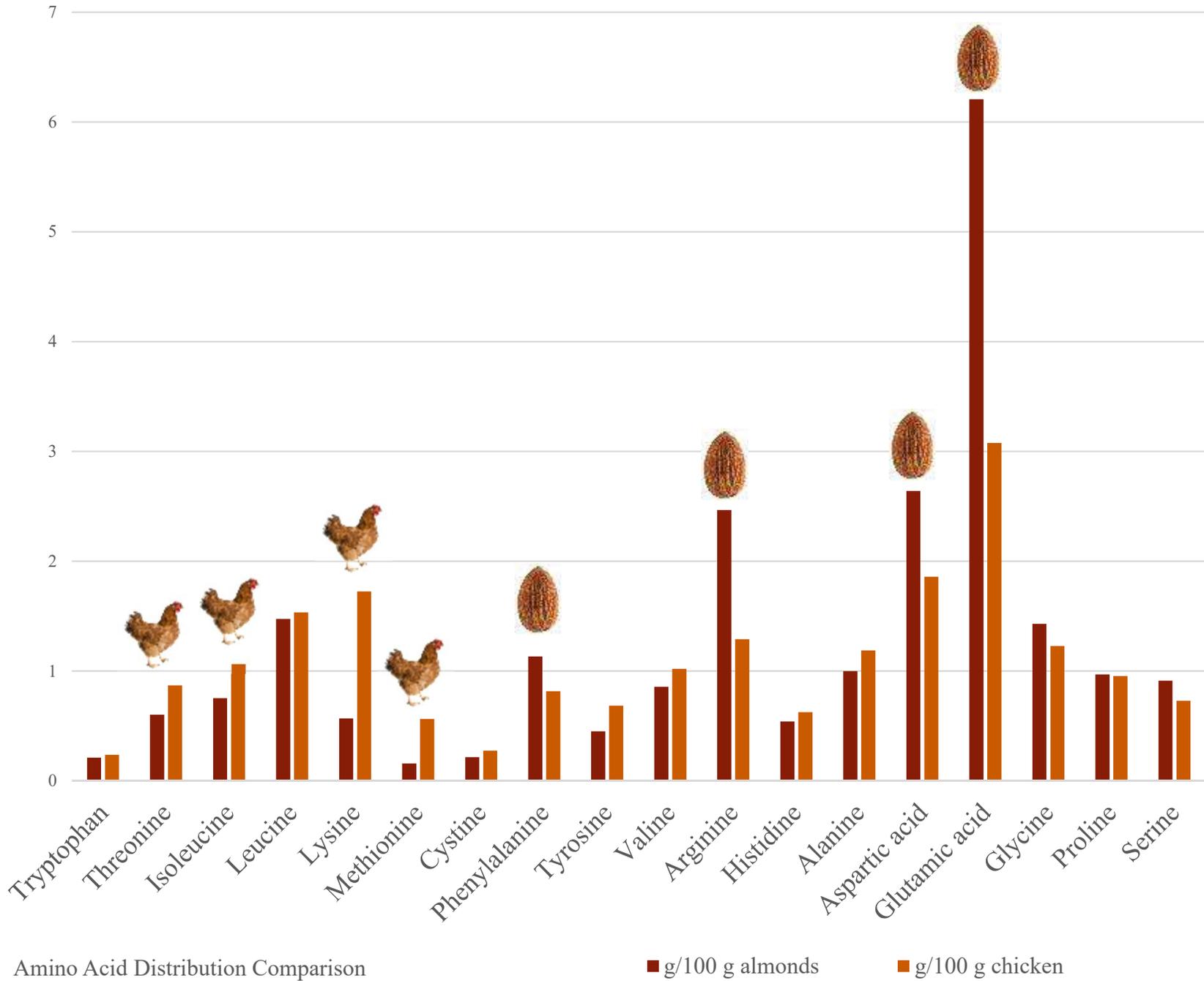
## *Amino acids*

- 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

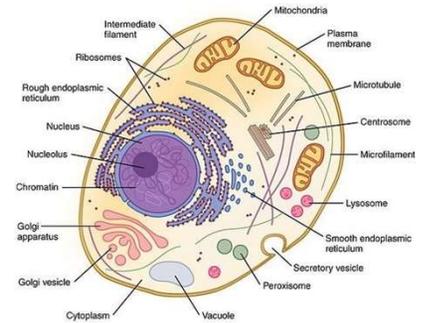
- Prevent cell damage by acting as antioxidants
- For the brain specifically, *minerals* iron, zinc, copper, sodium
  - Overall brain health and cognitive development is better with higher intakes



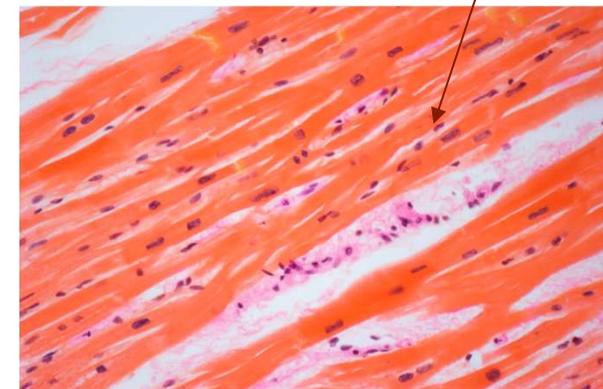
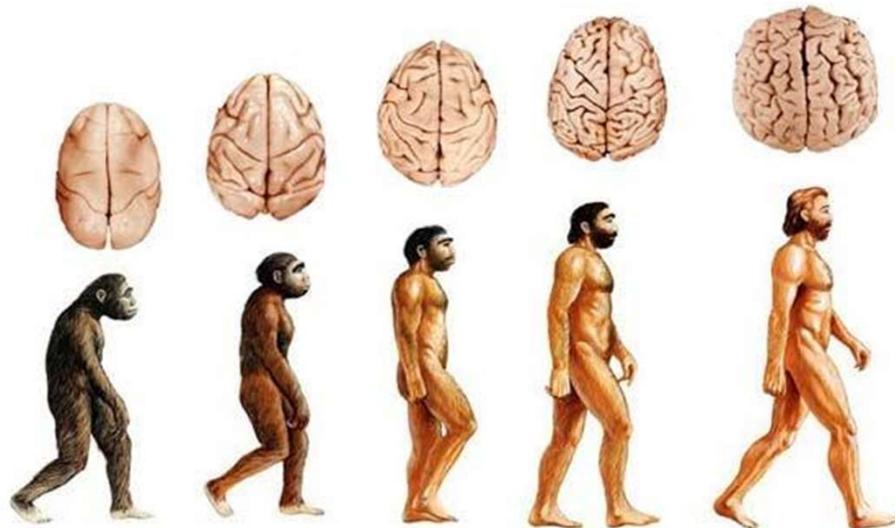
# Nutrients Used by Your Brain

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



*Heart muscle cells in you*

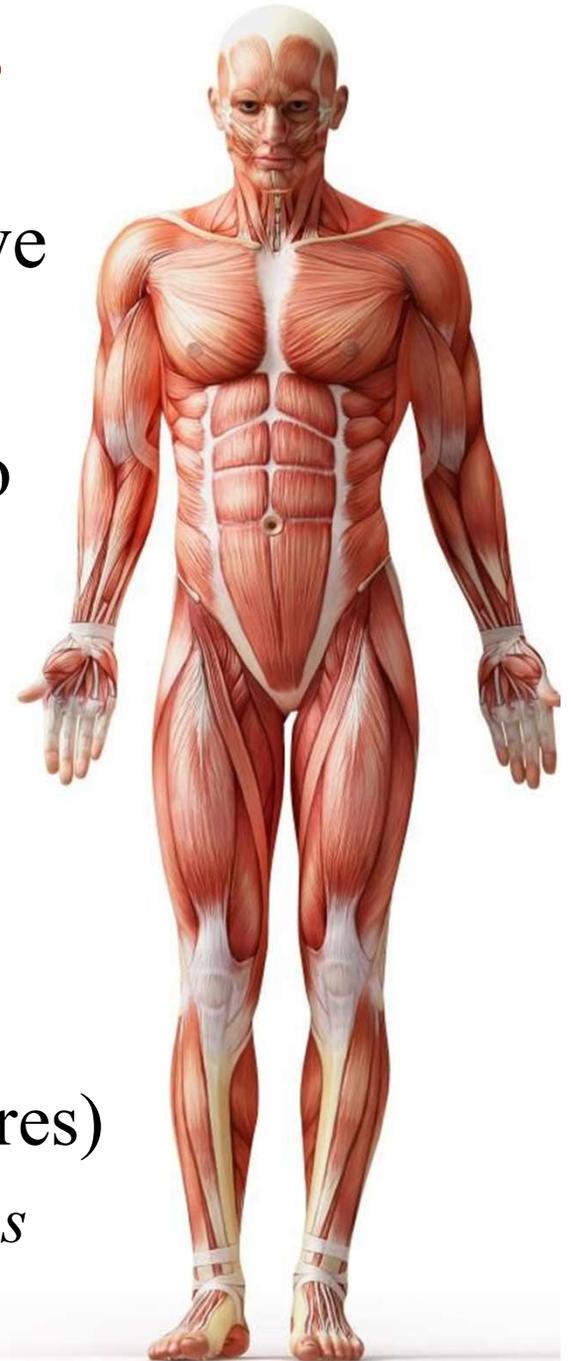
# Nutrients Used by Your Muscles

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:

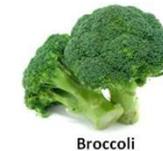
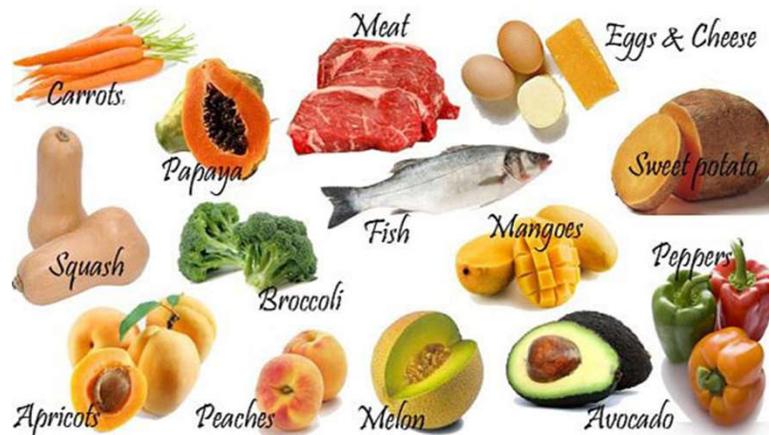
1. Exercise
2. Protein from lean sources
3. Glucose made by your liver from complex carbohydrates (starches/fibres)
  - Sourced from *whole grains* and *fibrous vegetables/fruits*



# Nutrients Used by Your Muscles

Muscles also require vitamins and minerals:

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



# The Mediterranean Diet

- One diet is never exactly right for everyone, but some generalities have been studied for disease risk
- Med Diet, in retrospective cohort studies, results in:
  - Reduced all-cause mortality risk by 8%
  - Reduced cardiovascular disease risk by 10%
    - 48% reduced risk in young men with diet high in *brassicas*
  - Decreased risk of death from cancer by 6%
  - Decreased risk of type 2 diabetes
  - Reduced risk of depression by 32%
  - Better cognitive performance/slower cognitive decline
  - Reduced risk of Alzheimer's disease

# Brassicas or Cruciferous Vegetables

Plants such as:

- Broccoli
- Cabbage
- Brussel sprouts
- Cauliflower
- Arugula
- Bok choy
- Radishes
- Kale



Contain the bioactive phytochemical family *glucosinolates* (Webb, 2018)

The [2015-2020 Dietary Guidelines for Americans](#) recommend that adults consume 1.5-2.5 cups of dark green vegetables a week.

# The Mediterranean Diet

Inspired by the eating habits of Greece, Southern Italy, and Spain in the 1940s and 1950s



# The Mediterranean Diet

UNESCO *Representative List of the Intangible Cultural Heritage of Humanity* of Italy, Spain, Portugal, Morocco, Greece, Cyprus, and Croatia.

*"The Mediterranean diet involves a set of skills, knowledge, rituals, symbols and traditions concerning crops, harvesting, fishing, animal husbandry, conservation, processing, cooking, and particularly the sharing and consumption of food."*



# The Mediterranean Diet

Definition in nutrition research is:

*At least two* of the following components;

- 1) *High* monounsaturated/saturated fat ratio
- 2) *Low to moderate* red wine consumption
- 3) *High* consumption of legumes
- 4) *High* consumption of grains and cereals
- 5) *High* consumption of fruits and vegetables
- 6) *Low* consumption of meat and meat products and increased consumption of fish
- 7) *Moderate* consumption of milk and dairy products.



# The Mediterranean Diet

What does it look/taste like?

*High* intake of:

- Olive oil – principle source of fat
  - Recommended daily calories from fat is 15-35%
  - 25-35% in Med Diet with saturated being less than 8%
- Vegetables – green leafy and brassicas
- Fresh fruits – consumed as desserts and snacks
- Nuts & seeds (e.g. 10-12 unsalted almonds)
- Legumes (e.g. chick peas, lentils, black beans)
- Whole grains (e.g. brown rice, barley, oats, quinoa)

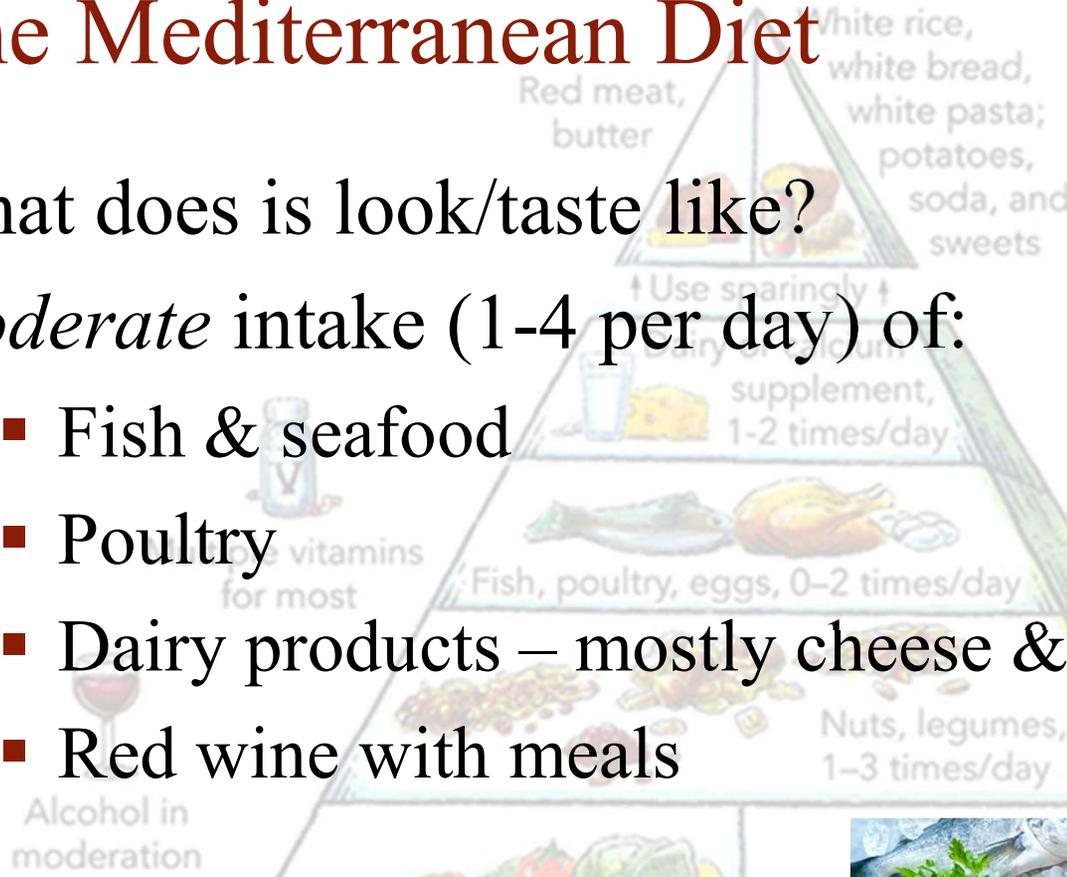


# The Mediterranean Diet

What does it look/taste like?

*Moderate* intake (1-4 per day) of:

- Fish & seafood
- Poultry
- Dairy products – mostly cheese & yogurt
- Red wine with meals



# The Mediterranean Diet

What does it look/taste like?

*Low* intake (0-3 per week) of:

- Eggs
- Red meat
- Processed meat
- Sweets – pastries, candy, cookies, etc.



# The Mediterranean Diet

## Olive Oil

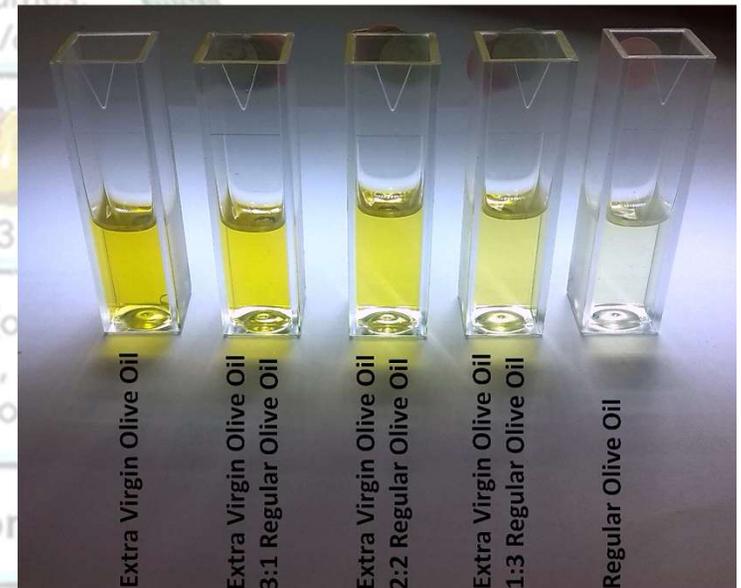
- Regular consumption may:
  - Lower risk of all-cause mortality
  - Lower risk of cardiovascular disease
  - Lower risk of cancer
  - Lower risk of neurodegenerative disorders
  - Lower risk of several/most chronic diseases
- The only monounsaturated fat to show this effect
- Why?
  1. Oleic acid (a specific type of monounsaturated fat)
  2. Polyphenols – a family of *phytochemicals*



# The Mediterranean Diet

## Olive Oil

- Problem with authenticity & extraction
  - Look for “*cold-pressed*” or “*cold-extracted*”
  - Look for production dates
  - Look for “Extra Virgin” olive oil (EVOO)
    - While not a guarantee it *should* mean it wasn’t heat or chemical extracted.
  - It should smell and taste ‘fresh’ and some combination of:
    - Green
    - Peppery
    - Earthy
    - Grassy



# The Mediterranean Diet Lifestyle

Any healthful diet, including the Med Diet, only work in the context of a *healthful lifestyle*.

Large retrospective cohort studies examining the incidence of disease suggests that *healthful lifestyles*:

1. Are physically active – 30 minutes a day
2. Have meaningful social relationships – share meals
3. Provide “*enough rest*” – allows time to acquire, cook, and eat food.

*Eating a healthful diet, in the context of a healthful lifestyle, offers the greatest protective effect against disease risk; you will live longer & have less disease.*

# Mediterranean Diet Toolkit: Supporting Patients to Reduce CVD Risk and Improve Mental Health.

Created by members of Dietitians of Canada Ontario Primary Health Care Action Group (PHCAG)  
Michele MacDonald Werstuck, Lee Kapuscinski, Denis Tsang

*November 2018*

*Meal plans,  
other tools,  
& information at:*  
[https://www.dietitians.ca/  
Dietitians-  
Views/Mediterranean-  
Diet-Toolkit.aspx](https://www.dietitians.ca/Dietitians-Views/Mediterranean-Diet-Toolkit.aspx)



# Toolkit and Additional Resources

## ➤ **Mediterranean Diet Toolkit: Supporting Patients to Reduce CVD Risk and Improve Mental Health**

(December 2018) Provides instructions and information on how to use the toolkit resources.

## ➤ **Mediterranean Diet PowerPoint presentation**

## ➤ **(Client handout) Healthy Eating Resources: Cookbooks and Recipe Website**

## ➤ **(Client handout) The Mediterranean Diet: A Guide to Healthy Eating**

## ➤ **(Client handout) Mediterranean Diet Sample Menu (1500 kcal)**

## ➤ **(Client handout) Mediterranean Diet Sample Men (2000 kcal)**

## ➤ **Mediterranean Dietary Pattern Assessment Process and Outcome Indicator Reporting Template**

## ➤ **(PSS Tools) Scoring, indicators and data tracking tools**

*How does all of this info fit into the context of the revised Canada's Food Guide?*

**Canada's food guide**

# Eat well. Live well.

**Eat a variety of healthy foods each day**



Have plenty of vegetables and fruits

Eat protein foods

Make water your drink of choice

Choose whole grain foods

**Healthy eating is more than the foods you eat**



Be mindful of your eating habits

Cook more often

Enjoy your food

Eat meals with others



Use food labels

Limit foods high in sodium, sugars or saturated fat

Be aware of food marketing

Discover your food guide at  
**Canada.ca/FoodGuide**

 Health Canada Santé Canada



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Source - <https://www.canada.ca/en/health-canada/services/publications/food-nutrition/educational-poster.html>

# Processed Foods

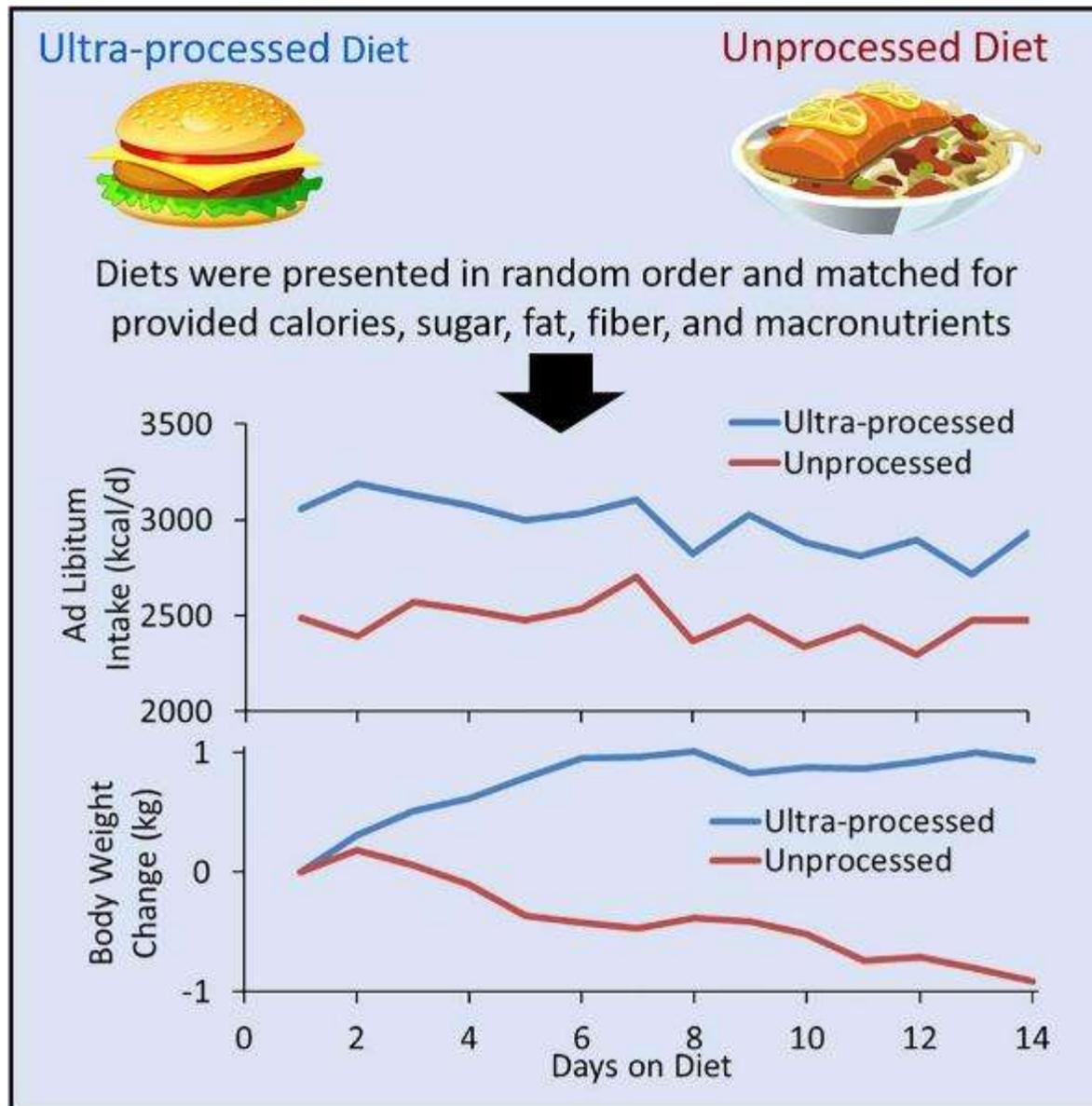


Image from Hall et al. May 2019 (NIH obesity research centre in MD USA)  
<https://www.sciencedirect.com/science/article/pii/S1550413119302487>

# 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](#)



# Organic Foods

*Do you wash your fruits & vegetables?*

- Depending on the specific pesticide only some, if any, will rinse off.
- What about **organic**?
  - Philosophy of not using pesticides
  - According to the Canadian Food Inspection Agency (CFIA) in 2014:  
*~1/2 contain pesticide residue*

*Related video:*

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

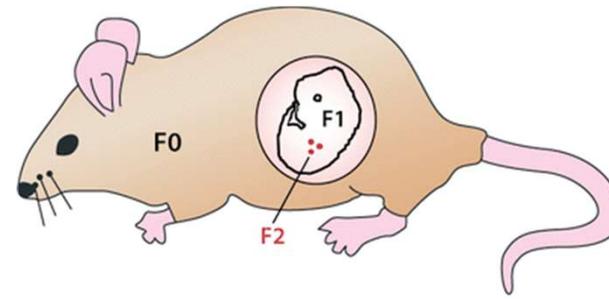
CFIA, 2016

Photo by Andrew Hendrickson

# Organic Foods

Some pesticides mostly *don't wash off*:

- *Vinclozolin*
- *Bifenthrin*
- *Chlorpyrifos*



 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

# *Noma* Restaurant in Copenhagen



Ants on yogurt & beef tartare with ants by chef Rene Redzepi, *Noma*

Nordic Food Lab has a mandate to use edible etymology for the future of nutrition.

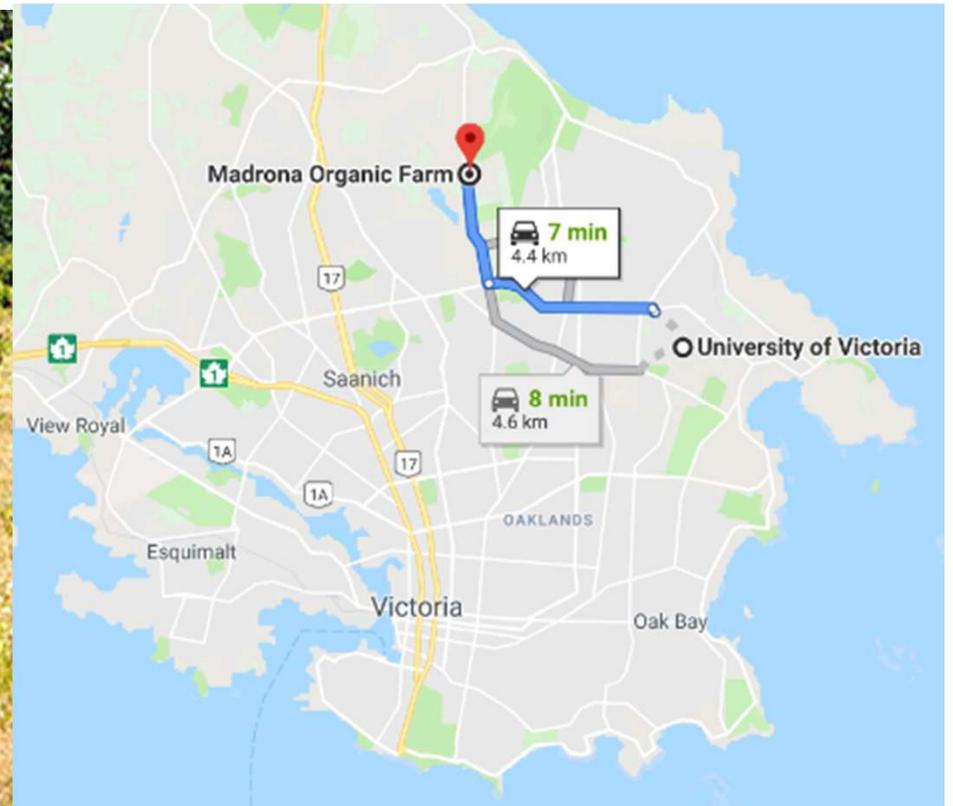
# Organic Foods

**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



# 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.”*



# Organic Foods

## *“Organic”*

- 95% of ingredients are organic

## *“Made with organic ingredients”*

- 70% or more of ingredients are organic



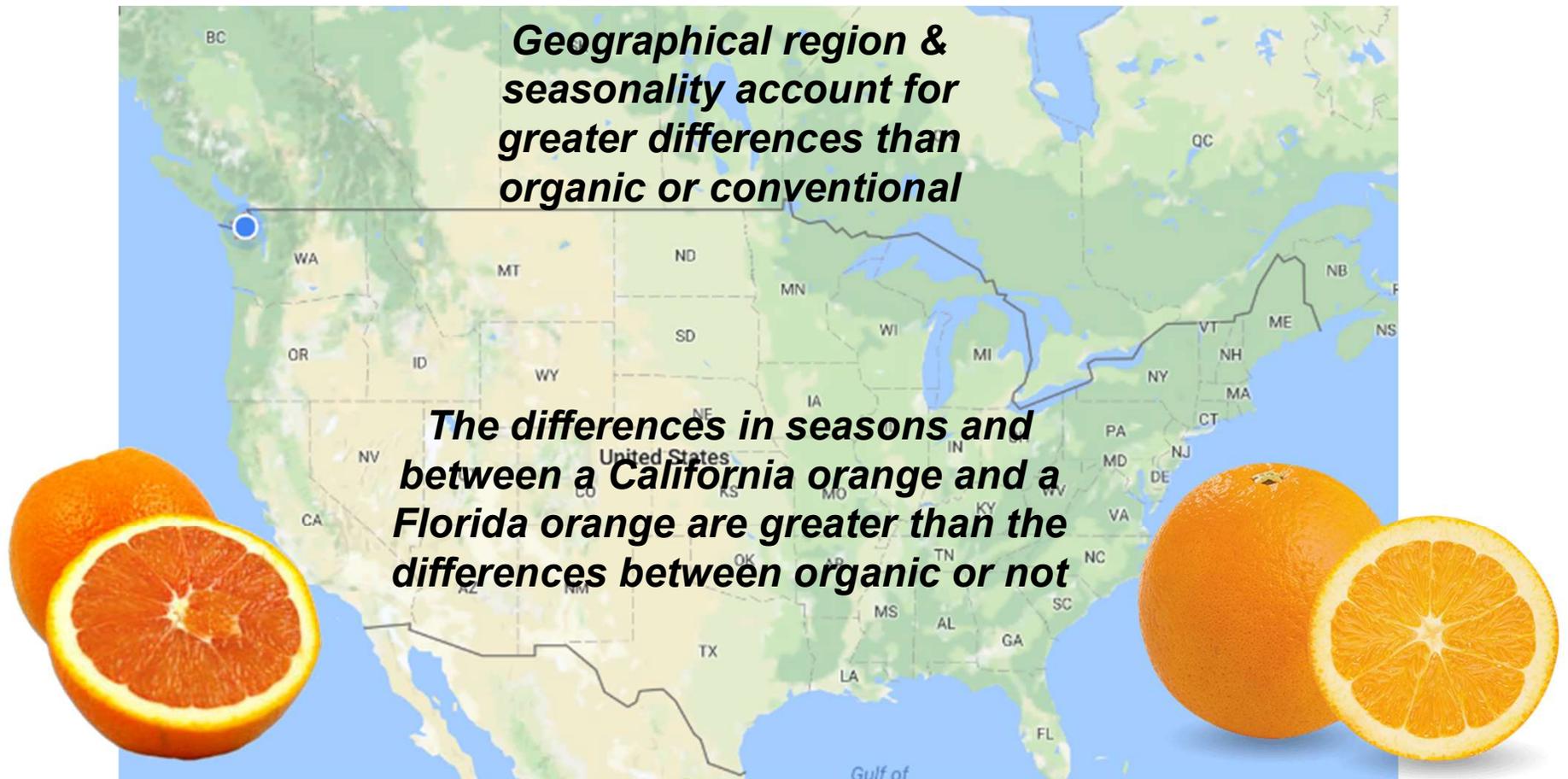
95% of the  
ingredients must be  
organic



70% of the  
ingredients must be  
organic

# 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)**



**Have plenty of  
vegetables and fruits**

**Eat protein foods**

**Make water  
your drink  
of choice**



**Choose  
whole grain  
foods**

**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***

# Phytochemicals (*phyto* = plant)

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

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

Most →

More →

Little →



**Table 2-1** Some Phytochemical Compounds Under Study

<b>Phytochemical</b>	<b>Food Sources</b>
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.



Chef Samuel Harris, Victoria BC

Photo by Andrew Hendrickson

*Your body evolved to eat food.  
Your body is what you ate.  
Eat where & when you live.*



Photo by  
Andrew Hendrickson

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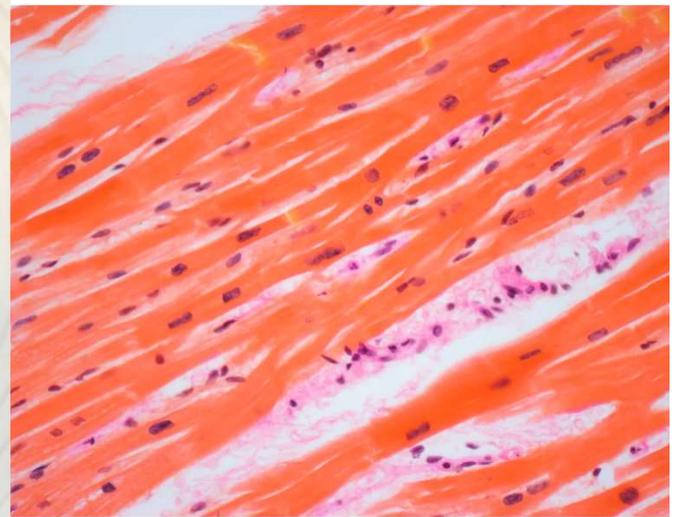
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