

FOOD & NUTRITION

Hydration & Macronutrients



Genesis School of Natural Health

WHAT IS NUTRITION?

- Nutrients are the chemical compounds in food that are used by the body to regulate body functions, protect every cell in body, and reproduce.
- Nutrition is the study of nutrients in food, how the body uses them, and the relationship between diet, health, and disease. Nutrition is also the application of the knowledge gained from the study of nutrients.
- Functional nutrition considers a person's diet, lifestyle, and environment to create personalized nutrition plans to improve, prevent, or reverse health conditions.
- Bio-individuality recognizes that each person has unique nutritional needs based on their biological makeup and current state of health. Bio-individuality determines a person's reaction to food, stress, toxins, exercise, and sleep.

WHAT IS A DIET?



Diets, in general, are philosophies that are not always based on our knowledge of nutrients.

Diets are often named and marketed as the best way to eat to have optimal health. They can be divided into categories like High Fat - High Protein - No Carbs - No Fruit - High Carbs - Low Fat - Grain Free...

A vegan diet, a plant-food only diet, sounds a lot like being a vegetarian but there is a key difference. Most vegetarians will eat honey, cheese, eggs, and other foods that come from an animal. Vegans reject eating animal meat but they also reject foods that were directly produced by an animal (eggs milk) or insect (honey).

BASIC CELLULAR REQUIREMENTS



Water / Hydration

Macronutrients:

- Protein (amino acids)
- Fats (saturated, monounsaturated, polyunsaturated)
- Carbohydrates (sugar, starches, and fiber)

Micronutrients:

- Vitamins (fat-soluble, water-soluble)
- Minerals (microminerals, trace minerals)
- Phytonutrients (carotenoids, flavonoids, ellagic acid, etc.)

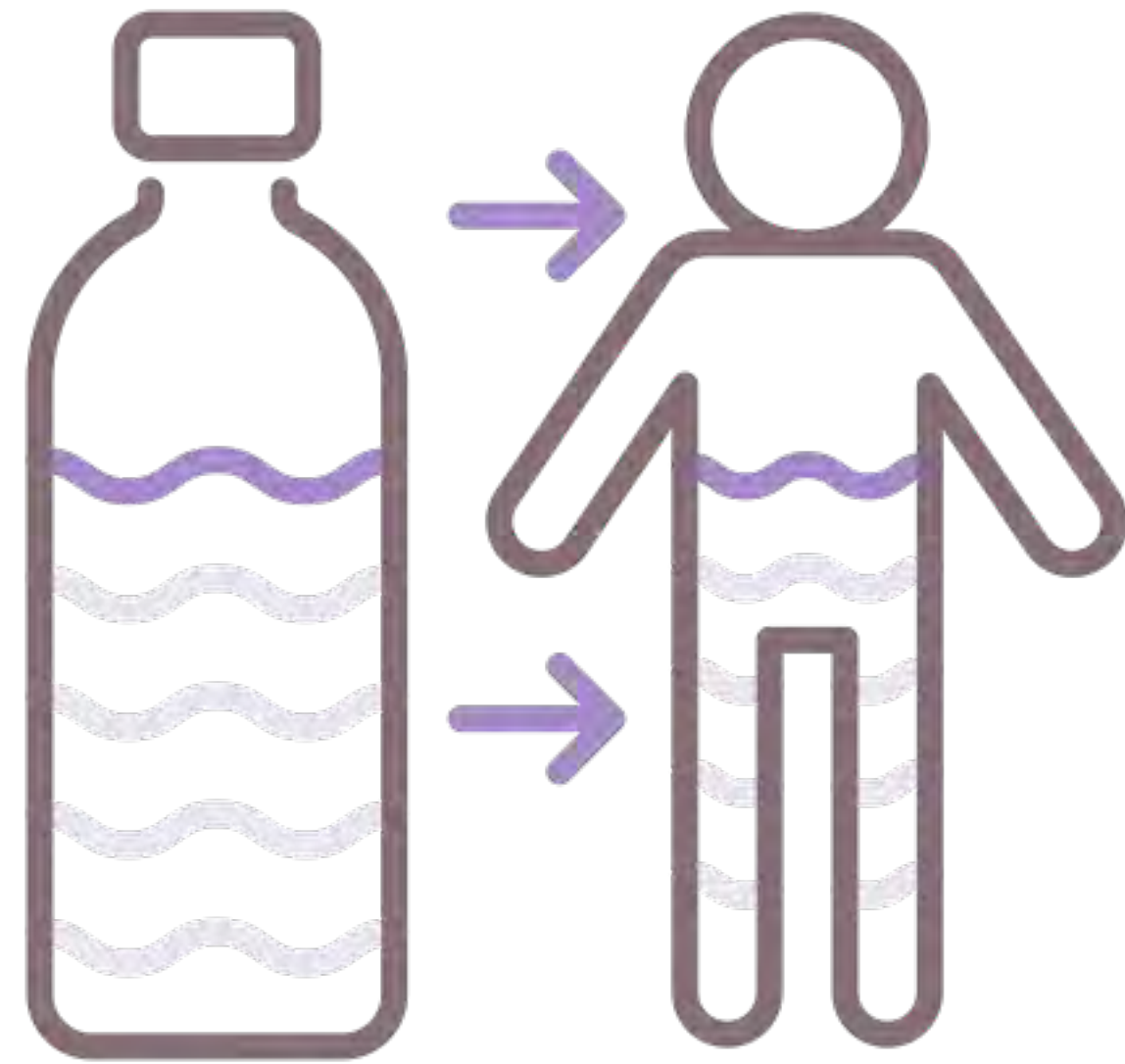
WATER / HYDRATION



Water is part of our body fluids that play key roles in:

- digestion
- carrying nutrients and oxygen to your cells
- flushing bacteria from your bladder
- preventing constipation
- normalizing blood pressure
- cushioning joints and protecting organs and tissues
- regulating body temperature
- maintaining electrolyte balance
- removing cellular waste products

INADEQUATE HYDRATION



Inadequate hydration can cause:

- Headaches
- Nausea
- Muscle cramps
- Constipation
- Bladder infections
- Fatigue
- and feeling dizzy or light-headed

The Cleveland medical clinic website says that when you are dehydrated your brain, and other tissues in your body, contract - they shrink. "As your brain shrinks, it pulls away from the skull, puts pressure on nerves and causes pain". They also stated that even mild dehydration can cause a headache.

ADEQUATE HYDRATION

Adequate daily **fluid** intake is 15-1/2 cups (about 3.7 liters) for men and 11-1/2 cups (about 2.6 liters) for women.

According to Harvard Health, healthy people need about 4-6 cups of **plain water** each day as long as they are getting the other fluids from juice, fruits, and vegetables.

As natural health professionals we would say that the other fluids should come from whole fruits, vegetables, herbal teas, and fermented beverages like kombucha [kuhm-boo-chuh] - not juice.

Everyone needs additional fluids when their activity level increases and when it is hot outside.

ADEQUATE HYDRATION

1. Consuming 4-6 cups of plain water is highly inadequate for most individuals.
2. Depending on food & drink choices and physical activity, individuals may need 8-12 cups of plain water.
3. Very few individuals are consuming enough healthy drinks, fruits, and vegetables to equal 9-11 cups of the additional fluid each day.
4. Too many individuals consume foods and drinks that lead to a loss of fluids.



Choices that cause a loss of fluids:

- **Sugar:** pop/soda, sweet tea, coffee drinks, fruit juice, and “athletic” drinks
- **Caffeine:** coffee, energy drinks, pop/soda
- **Alcohol:** all alcohol and mixed drinks are often alcohol and sugar
- **Excess Protein** - more than your body needed at the time

CLEAN WATER



It is important to have clean water and your tap water is not clean.

Reverse osmosis and distillation are very effective at removing metals, pesticides, and the thousands of other chemicals that eventually make it into our water supply. It is true that reverse osmosis and distillation will also remove minerals but minerals are easily replaced when you are eating vegetables or drinking herbal teas.

There are also some excellent filters on the market that can remove almost anything in the water, some are comparable to reverse osmosis.

The last choice would be the simple filters that can remove larger molecules like chlorine. Not ideal but still better than nothing at all.

WATER TOXICITY

In addition to the many household, agriculture, and manufacturing chemicals, we can add drugs. Many chemicals in our water supply come from drugs. Yes, some people flush pills down the toilet but, most of the drugs that end up in the water supply are from the body metabolizing prescription drugs and then eliminating them via the kidneys and feces.



Pharmaceuticals commonly unchanged/persisting through treatment include carbamazepine (for seizures), bupropion (Wellbutrin - anti-depressant), cotinine (formed by the breakdown of nicotine), metoprolol (for chest pain and high blood pressure), and lithium (used for mania and bi-polar disorders).

WATER & PFAS



A recent study revealed that at least 45% of tap water in the United States is contaminated with PFAS (per- and polyfluoroalkyl substances), also known as forever chemicals. PFA substances are a group of nearly 15,000 chemicals that are used in many of products, including clothing, carpets, food packaging, adhesives, paints, and fire-fighting foams.

Exposure to PFAS has been linked to:

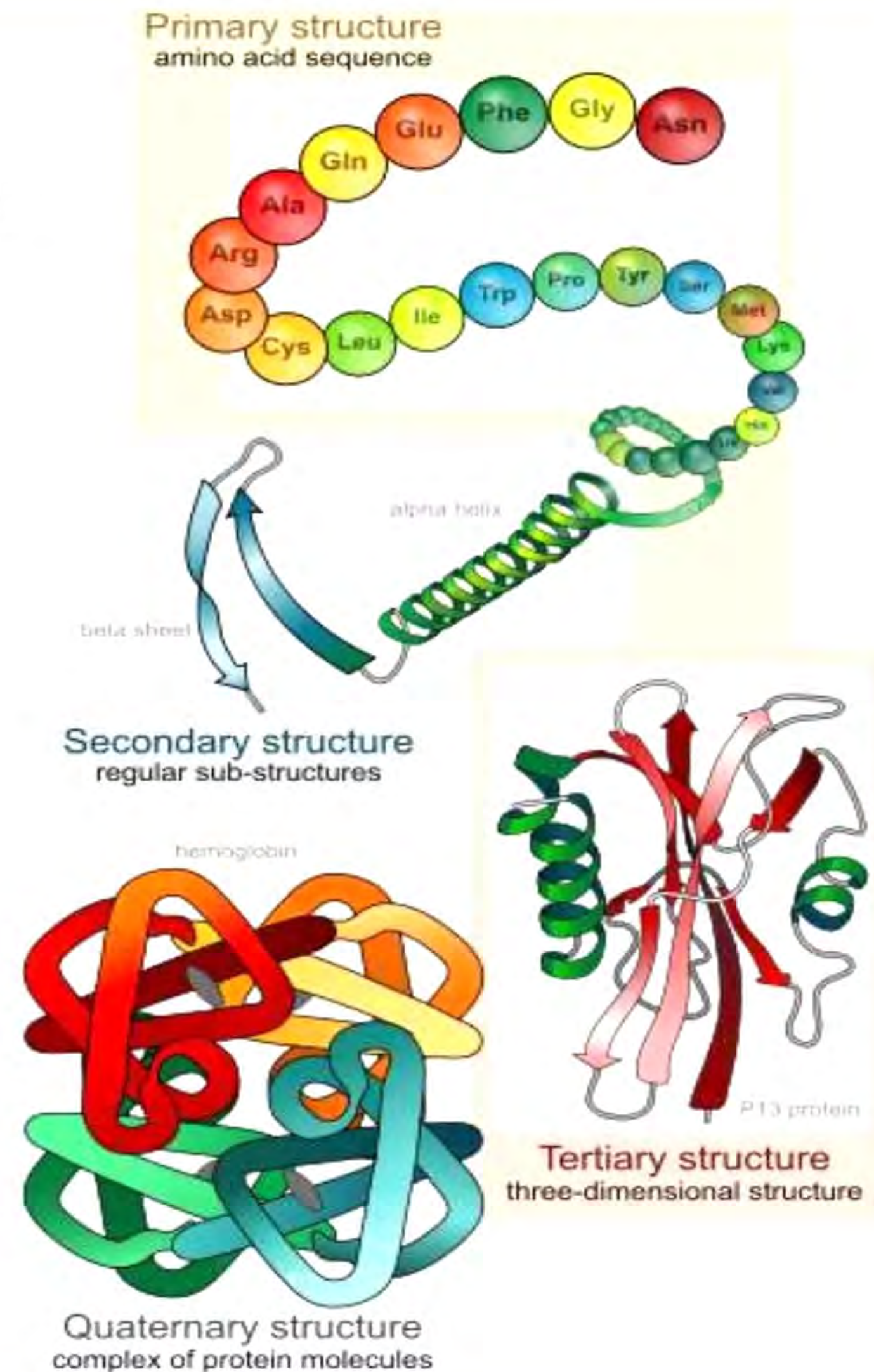
Reproductive and fertility issues, developmental issues in children, an increased cancer risk, immune dysfunction, hormone dysregulation, increased cholesterol, and risk of obesity. Chemicals linked to obesity are called obesogens.

PROTEIN STRUCTURE

Proteins are long chains of molecules made up of hundreds of smaller units called amino acids.

Proteins exist in a folded state and require multiple types of enzymes to break them down into amino acids that can be used in the body. The body then uses the amino acids to create the over 100,000 different proteins it requires to function.

Proteins made in the body can be grouped into 7 types: antibodies, contractile proteins, hormonal proteins, structural proteins, storage proteins, transport proteins, and enzymes.



AMINO ACIDS

Amino acids, after water, are the largest component in our body. They make up about 20% of our weight and about 50% of our solid body mass.

All 20 amino acids are essential for body functions. They are categorized by whether or not they must be consumed or if the body is capable of making them.



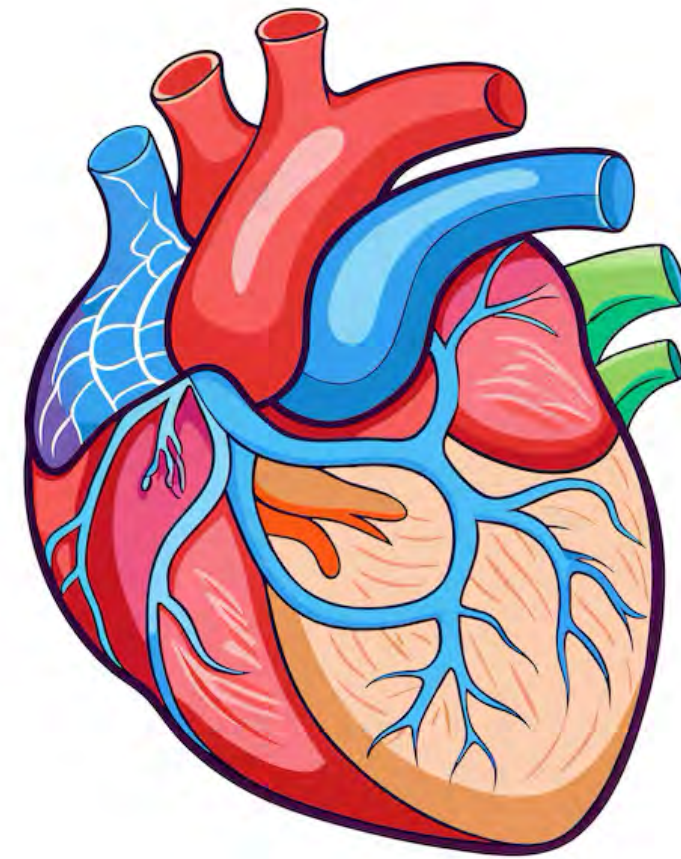
- **Essential** - must be supplied by the diet
- **Conditionally Essential** - depends
- **Non-Essential** - the body can create them if not in the diet

There are 5 non-essential amino acids: Alanine, Asparagine, Aspartic acid, Glutamic acid, and Serine

AMINO ACIDS

Six amino acids are termed conditionally essential because healthy bodies can produce them under “normal” conditions.

1. Arginine
2. Cysteine
3. Glutamine
4. Glycine
5. Proline
6. Tyrosine



When a body is physiologically stressed, the conditionally essential amino acids become essential nutrients that must be supplied in the diet.

Physiologically stressed refers to injury, illness, reduced liver function, inadequate nutrients, high mental stress, pregnancy, and aging.

Cardiovascular disease is an example of a physiologically stressful condition. Clinical studies revealed that CoQ10 and the amino acids l-arginine and l-carnitine are inadequately produced in patients with cardiovascular diseases.

AMINO ACIDS

Nine amino acids are called essential because they cannot be produced within the body, they must be supplied through our food.



1. Histidine
2. Isoleucine
3. Leucine
4. Lysine
5. Methionine
6. Phenylalanine
7. Threonine
8. Tryptophan
9. Valine

Foods that contain all 9 essential amino acids are called **complete proteins**. They include beef, poultry, fish, seafood, eggs, dairy, soy, quinoa, chia seeds, and buckwheat.

Foods that contain some but not all 9 essential amino acids are called **incomplete proteins**. These foods include nuts, seeds, beans, rice, and some grains.

Beef, chicken, and fish contain all 20 amino acids used by the human body.

Eggs contain 18 of the amino acids.

PROTEIN - RDA

The Recommended Daily Allowance for protein is about 7 grams for every 20 pounds of bodyweight.

- If you weigh 140 pounds, you should eat about 50 grams of protein in a day.
[140 lbs /20 = 7 and 7 x 7 =49]
- To determine your RDA for protein (grams) multiply your weight by 0.36
- If you are basing the protein content of your diet on 2000 calories per day (protein has 4 calories per gram) and want to have 35% of the calories as protein:



What is 35% of 2000?

$$X = 35\% \times 2000$$

$$.35 \times 2000 = 700 \text{ calories from protein}$$



INCREASED PROTEIN NEEDS

According to MayoClinic:

Once you reach ages 40–50, sarcopenia, or loss of muscle mass, begins to set in. To prevent it your protein needs increase to about 1–1.2 grams per kilogram body weight or 75–90 grams per day for a 165-pound person.



People who regularly exercise have higher protein needs of about 1.1–1.5 grams per kilogram of body weight. People who regularly lift weights, or are training for a running or cycling event need 1.2–1.7 grams per kilogram.

General recommendations are to consume 15–30 grams of protein at each meal.

PROTEIN SOURCES

Keep in mind that a person who weighs 140 pounds requires a minimum of 50 grams of protein.

3 oz. Steak - 23 grams

3 oz. Tuna, Salmon, Haddock, Trout - 21 grams

3 oz. Turkey, Chicken, Hamburger - 19 grams

6 oz. Greek yogurt - 17 grams

1 oz. Swiss cheese - 8 grams

1/2 cup Cottage cheese - 14 grams

1 Egg - 6 grams

1/4 cup Nuts: cashew, hazelnut, walnut, almonds, etc. - 7 grams

1/2 cup cooked beans: green peas, kidney beans, black beans, etc. - 5 to 7 grams

1 cup cooked: Wheat Pasta, Quinoa, Brown Rice, Wild Rice - 6 to 8 grams

1/2 cup Buckwheat - 11 grams

1 Tablespoon of dried Seaweed / Spirulina - 7 grams

1/2 cup cooked: Brussel sprouts, spinach, collards, asparagus, squash, sweet potatoes, broccoli, tomatoes, and most other vegetables - 2 to 3 grams

PLANT PROTEIN

Not all plant foods have the same amino acid profile. Eating a variety of plant-based foods daily is vital to obtaining all nine essential amino acids.

For example, grains like rice are low in lysine but lentils, beans, and wild rice are higher in lysine - you can obtain all nine essential amino acids by eating them together.

Common pairing:



Legumes and grains: Pair legumes like beans, lentils, or chickpeas with wild rice, or grains like rice, wheat, or barley. A traditional pairing is rice and beans.

Legumes and nuts or seeds: Add nuts or seeds to legumes to improve the amino acid profile. For example, top lentil soup with crushed nuts or seeds or enjoy lentil soup with a muesli bar (made with a variety of seeds).

WILD RICE - *Zizania palustris*

Wild rice is not actually a rice, it is an annual aquatic grass seed that is often called a pseudo grain or false grain. It grows wild in isolated lakes and river bed areas in northern Minnesota and Wisconsin. It is also native to Asia.

Regular rice is low in lysine but wild rice is high in lysine. Wild rice is also a good source of iron, folate, potassium, choline, lutein, zeaxanthin, and varying amounts of 18 amino acids. As a whole food it contains several different vitamins and minerals.



"Wild Rice is the most nutritive single food which the Indians of North America consume. The Indian diet of this grain, combined with maple sugar, and with bison, deer, and other meats, was probably richer than that of average American family of today." - Albert E. Jenkins, Wild Rice and The Ojibway People

FATS / MONOUNSATURATED

Almost all foods contain both saturated and unsaturated fats. Many foods also contain both monounsaturated fatty acids (MUFAs) and polyunsaturated fatty acids (PUFAs).

MUFAS include omega-9 (oleic acid) and omega-7 (palmitoleic acid) fatty acids.



Sesame Seed Oil: 33-44% oleic acid (omega-9), 40–50% linoleic acid (omega-6)

Olive Oil: 55-85% oleic acid (omega-9), linoleic acid (omega-6), and palmitic acid (omega-7)

Macadamia Nut Oil: 60% oleic acid (omega-9), 19% palmitoleic acid (omega-7)

Macadamia nuts, hazelnuts, almonds, pecans, avocados & avocado oil, sunflower oil, canola oil, and safflower oil also contain high levels of monounsaturated fatty acids.

FATS / POLYUNSATURATED

Polyunsaturated fatty acids include omega-6 and omega-3 fatty acids. They are essential fatty acids because our bodies are unable to make them, they must be obtained through diet.



- Omega-6 is linoleic acid (LA)
- Omega-3 is alpha-linolenic acid (ALA)
- Long-Chain Omega-3 fatty acids are eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).

EPA and DHA can be synthesized in the body from ALA but it is very inefficient.

Healthy young men - only about 8% of dietary ALA was converted to EPA and 0%-4% was converted to DHA.

Healthy young women - approximately 21% of dietary ALA was converted to EPA and 9% was converted to DHA.

Gamma-linolenic acid



Gamma-linolenic acid (GLA) is an omega-6 fatty acid found in evening primrose, borage, and black currant seed oils. GLA is useful for diabetic neuropathy, rheumatoid arthritis, and inflammation, especially if omega-3 fatty acids are taken concurrently.

- Borage oil contains 20-24 percent GLA.
- Evening primrose oil contains 8 -10 percent GLA
- Black currant seed oil contains 15 to 17 percent GLA

Evening primrose oil has been shown to help with both PMS and menopause symptoms. Native Americans used evening primrose oil to heal wounds and soothe stomach pains. Primrose, taken internally and used externally can significantly improve skin moisture, firmness, and elasticity.

FATS/RATIOS

An omega-6 to omega-3 ratio of 4:1 or less is ideal.

Many, if not most Americans are consuming a ratio of 20:1 or more!

This is primarily due to the increased use of omega-6 rich seed oils, such as soybean, corn, and safflower oil. Corn oil has an omega-6/3 ratio of approximately 60:1 and safflower oil is 77:1. About 55% of the fatty acids in soybean oil are also omega-6s.



Canola oil is considered “healthy” because like olive oil it is high in monounsaturated fat (63%) and contains omega-3 fatty acids (9-11%). The problem is that canola is chemically extracted with the solvent hexane and heat is often applied which can turn it rancid, destroy the omega-3s, and can even create trans fats.

Omega-3 (ALA) and Long-chain Omega-3 Fatty Acids (DHA & EPA)

Food	Grams per serving		
	ALA	DHA	EPA
Flaxseed oil, 1 tbsp	7.26		
Chia seeds, 1 ounce	5.06		
English walnuts, 1 ounce	2.57		
Flaxseed, whole, 1 tbsp	2.35		
Canola oil, 1 tbsp	1.28		
Black walnuts, 1 ounce	0.76		
Soybean oil, 1 tbsp	0.92		
Edamame, frozen, prepared, ½ cup	0.28		
Refried beans, canned, vegetarian, ½ cup	0.21		
Kidney beans, canned, ½ cup	0.10		

Food	Grams per serving		
	ALA	DHA	EPA
Salmon, Atlantic, 3 ounces		1.24	0.59
Herring, Atlantic, cooked, 3 ounces		0.94	0.77
Sardines, canned in tomato sauce, drained, 3 ounces*		0.74	0.45
Mackerel, Atlantic, cooked, 3 ounces		0.59	0.43
Sea bass, cooked, 3 ounces		0.47	0.18
Trout, rainbow, wild, cooked, 3 ounces		0.44	0.40
Tuna, light, canned in water, drained, 3 ounces		0.17	0.02
Anchovies, raw, 3 ounces		0.77	0.46
Algal Oil is a supplement extracted from various algae species.		Yes	Yes

FATS - RDA #1

Dietary fats have been both vilified and glorified in relation to health and disease. Studies connecting fat intake to cardiovascular disease, cancer, and obesity did not take into consideration the type of fats (e.g. hydrogenated vs butter) or how much sugar, soda/pop, and other foods were consumed.



Surprisingly, the Recommended Daily Allowance for unsaturated and saturated fat is a good guideline for healthy people. The RDA falls short of a truly healthy fat guideline because it ignores, does not define, the proper ratios of omega-6 and omega-3.

Adults and children should consume a minimum of 500 mg of EPA and DHA each day. Higher amounts are often needed for individuals with metabolic risk factors and during pregnancy.

FATS - RDA #2

Based on the guidelines, children require more total fat per day but, all ages should consume 10% or less of their calories as saturated fat. Dietary guidelines in the U.S:



- Total Fat: 20% to 35% of daily calories - Adults
- Total Fat: 25% to 35% of daily calories - Children ages 4 to 18
- Total Fat: 30% to 40% of daily calories - Children ages 1 to 3
- Saturated Fat For All Ages: 10% total daily calories

If your daily calories are 2,000 your **total fat should be (20%-35%) 44-78 grams** per day with about (10%) 20-22 grams of the total consisting of saturated fat.

Every edible oil has about 120 calories and 13 grams of fat per tablespoon.

SATURATED FATS

Foods high in saturated fats include beef, lamb, pork, poultry skin, lard, coconut oil and palm fruit & palm kernel oil, and dairy products like ice cream, whole milk and cheese.

Saturated fatty acids exist as short, medium, and long-chain triglycerides. Long-chain fatty acids are broken down in the intestines and enter circulation through the lymphatic system. The short-chain, and most of the medium-chain fatty acids, enter the portal blood and are transported to the liver where they are quickly metabolized.

The most common saturated fatty acids are:

- Lauric acid (coconut and palm kernel oil, cow's milk)
- Myristic acid (cow's milk and dairy products)
- Palmitic acid (palm oil and meat)
- Stearic acid (meat and cocoa butter)



COCONUT & PALM OILS

Oils: Coconut oil contains about 92% saturated fatty acids, palm kernel oil contains around 82% and palm fruit oil contains approximately 50%.

About 50% of saturated fat in coconut and palm kernel oil consists of the medium-chain fatty acids called lauric acid (a triglyceride - MCT). When it is transported to the liver and metabolized the result is immediate energy, ketone body production, and a thermogenic response.



Coconut oil contains about: 46–54% lauric acid, 5–10% caprylic acid and 5–8% capric acid.

Palm kernel oil contains about: 45–50% lauric acid, 3–5% caprylic acid, 3–4% capric acid and 0.1–0.5% caproic acid.

GRAMS OF FAT IN SELECT FOODS

FOOD	Approximate grams of fat per serving
10 Almonds, Cashews, Hazelnuts, Macadamia nuts	15-20
5 Brazil nuts, Chestnuts, Walnuts	20
1 Tbsp, whole Flaxseed	4.3
1 ounce Chia seeds	9
3 ounces Salmon (wild-caught)	6
1 cup Mackerel	34
3 ounces Tuna	5
3.5 ounces of Lake Trout	4.5
1 can - 3.75 oz. Sardines	17
1 Egg Yolk	4.5
1 Tbsp Butter	12
4.5 ounces Beef Steak	24
1 Whole Avocado	29

BEEF / RED MEAT

A four ounce (1/4 lb) cooked hamburger patty (85% lean meat / 15% fat) will provide about 22 grams of complete protein (all 20 amino acids) and 13 grams of total fat (about 8 grams saturated fat).

Red meat contains two types of saturated fatty acids: stearic acid and palmitic acid. About half of the fat in red meat is unsaturated fatty acids.

Grass-Fed Beef intramuscular fat consists on average of:

- 50% saturated fatty acids (about 30% is stearic acid)
- 45% monounsaturated fatty acids
- 5% polyunsaturated fatty acids (including omega 3, omega 6 and CLA or conjugated linoleic acid)

A 3-1/2 ounce serving of hamburger provides 100% of B12, 40% of zinc, 15% of iron, 12% of magnesium, and many other minerals. Two large eggs supply about 46% of our B12 in an easily absorbable form.

NUTS & SEEDS

Nuts and seeds are packed with a variety of nutrients and an impressive amount of unsaturated fatty acids (5-10 provide 20 grams). In general, nuts contain vitamin E, B6, niacin, folate, and the minerals magnesium, zinc, copper, selenium, phosphorus and potassium. Most nuts contain 7 grams of protein per 1 /4 cup. Many seeds, per ounce, contain 5-8 grams of protein.

- Pistachio nuts have a high level of potassium.
- Chia seeds and flax seeds provide soluble fiber.
- Brazil nuts have high amounts magnesium and selenium.
- Almonds and sesame seeds (tahini) are a good source of calcium.
- Chia seeds, hemp seeds, and walnuts have omega-3 fatty acids.
- Pine nuts, cashews, and pumpkin seeds, and hemp seeds have a high zinc content.



ANTI-NUTRIENTS



Some of the compounds produced by plants can inhibit the absorption of minerals and other micronutrients when we consume them. We call the compounds that inhibit the absorption an anti-nutrient.

The most common anti-nutrients are, lectins, phytates, and oxalates.

- **Lectins** are a common protein but the highest levels are in nuts, legumes, seeds, raw wheat and wheat germ. Insignificant amounts of lectins are consumed when we eat fresh fruits and vegetables. Because lectin is a protein, it can be denatured/broken down with heat/boiling.
- **Phytates** are water-soluble and the main storage form of phosphorus in some nuts, seeds, legumes, and whole grains. Phytates can decrease the absorption of iron, zinc, magnesium, and calcium. Soaking will reduce them.
- **Oxalates** are not a problem for the most people. A diet that is varied and balanced will offset any issues with eating highly nutritious spinach, chard, beets, sweet potatoes, and the many other foods that contain oxalate.

ANTI-NUTRIENTS: NUTS & SEEDS

Soaking: Completely cover the nuts in cold water. Soaking will significantly reduce their anti-nutrient content. Always rinse your nuts after soaking and then eat immediately, dehydrate, or refrigerate. Soaked nuts can be stored in the fridge for up to 4 days if drained very well, and kept in an airtight container.

- **Almonds** are high in phytic acid and oxalates - soak for 8-10 hours.
- **Walnuts** have high levels of phytic acid but they are oily and should not be soaked for longer than 4-6 hours. **Brazil** nuts are very oily, soak for 4 hours or less.
- **Hazelnuts** contain a very low level of anti-nutrients. **Cashews** are delicate and very oily so soaking should only be a couple of hours.

Not all seeds can be soaked! Flax seeds turn into a mucilaginous glob in water.

ANTI-NUTRIENTS: LEGUMES

Legumes include beans, peas, and lentils. They contain water-soluble phytic acid, an indigestible protein called lectin, and the gas producing oligosaccharides.

It takes 12-16 hours to soak most peas and beans correctly. Change the water twice and rinse after soaking. Soaking significantly decreases phytic acid as well as α -amylase inhibitors, and trypsin inhibitors. Amylases are enzymes that breakdown starch and trypsin is an enzyme used in protein digestion. Soaking also removes over 75% of the gas producing oligosaccharides. **Cook until very tender, do not eat under-cooked peas or beans.**



Green and brown lentils should be soaked for 3 or more hours.

Boiling legumes eliminates almost all lectins. Soaking, sprouting, and fermenting will also reduce the lectin content. If you have soaked your legumes, cooking them in a crock pot or pressure cooker will eliminate (breakdown) the lectin protein. **Microwaves to not reduce lectins.**

CARBOHYDRATES

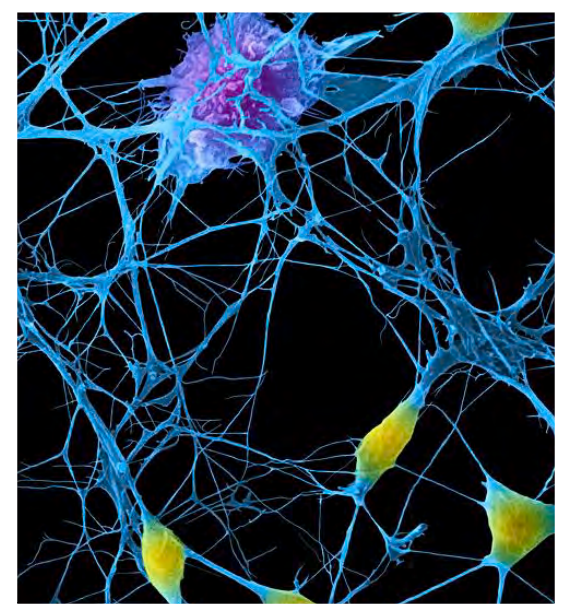


In general, carbohydrates are the sugars, starches and fibers found in fruits, grains, legumes, and vegetables. Most of the fructose in fruits and certain vegetables, and the starches in legumes and certain vegetables, are broken down (metabolized) and transported to our cells as glucose.

Fiber is a type of carbohydrate that the human body can't digest so it is not broken down into sugar molecules. It is metabolized by our microbiota - it is a prebiotic.

Glucose is used by our cells to produce a molecule called ATP (adenosine triphosphate). ATP molecules store and supply the energy needed for body functions. In addition to glucose, fatty acids and amino acids are also metabolized and used for energy. Amino acids only supply about 10%–15% of ATP generated by cells but fatty acids are a significant source of energy for cells.

CARBOHYDRATES



Fun Fact: A single cortical neuron (a type of nerve cell in our brain) uses approximately 4.7 billion ATPs per second in a resting human. Since brain cells run on glucose and are unable to store the it, they need a steady supply. This is why children are so hungry after school!

Fruit and a handful of nuts and seeds will satisfy their brains and keep the blood glucose levels steady. The best after-school snacks will include protein, fat, and a complex carbohydrate food. Complex carbohydrates are a preferred brain food, providing a slow, sustained supply of glucose.

Simple carbohydrates are simple sugars that are quickly digested and tend to spike blood sugar levels. For cellular health we need complex carbohydrate foods.

COMPLEX CARBOHYDRATES

Complex carbohydrates, the sugars, starch, and fiber in whole foods, require time to digest. Slower digestion means there will be a slower release of glucose into the blood stream. This prevents a sudden rise in blood sugar (glucose) levels.



Fructose is the primary sugar found in fruits, some vegetables, and honey. Fructose is most commonly metabolized in the liver but, the intestines, kidneys, adipose tissue, and muscles can metabolize some of the molecules. After the fructose is converted into glucose it will enter the blood system.

Starch is complex carbohydrate, it is made up of long chains of glucose molecules. Less processed starches, like brown rice, lentils, and oatmeal, raise blood sugar more slowly than more processed starches, like white rice and white bread.

FRUIT FRUCTOSE

Low Sugar Fruits contain 1 - 13 g of sugar per serving

- Lemons & Limes
- Peaches & Nectarines
- Raspberries, Blackberries & Strawberries
- Grapefruit, Oranges & Clementines,
- Kiwis & Starfruit
- Avocado
- Fig (one)
- Honeydew Melon (one cup)
- Watermelon (one cup)
- Cantaloupe (one cup)
- Papaya (one cup)



**Fruits between low and high
sugar rating:** Banana, Pear, Apple,
Dates (3-4), Figs (2), and Grapes
(one cup).

Fruits highest in sugar - per cup:
Lychees (29 grams)
Passion-Fruit (26 grams)
Pomegranate (24 grams)
Mangoes (23 grams)
Cherries (20 grams).

Dried fruits have concentrated
amounts of sugar!

STARCH

Starch is a polysaccharide that is found in many vegetables, fruits, and grains.

Polysaccharides are very large molecules that can contain thousands of monosaccharides. The three most abundant polysaccharides are starch, glycogen, and cellulose. They are especially abundant in cereal grains (seeds) and tubers.



Starch is a mixture of two polymers: amylose and amylopectin. Natural starches consist of about 10-30% amylose and 70-90% amylopectin.

Amylose is a resistant starch that is not digestible. Instead it is fermented by our gut bacteria - functions as a prebiotic.

Amylopectin is water-soluble, and when digested it provides an abundance of glucose molecules for the production of cellular energy.

FIBER

Fiber is a type of carbohydrate that the body can't digest. Adults need 28-34 grams of fiber each day. The average fiber intake in the U.S is 17 grams.



Soluble fiber dissolves in water and can help lower glucose levels as well as help lower blood cholesterol. Foods with soluble fiber include oatmeal, chia seeds, nuts, beans, lentils, apples, and blueberries. Soluble fibers act as prebiotics - they feed the beneficial bacteria in our intestines.

Insoluble fiber does not dissolve in water. It helps food move through your digestive system and prevents constipation. Foods with insoluble fibers include quinoa, brown rice, legumes, leafy greens like kale, almonds, walnuts, seeds, and fruits with edible skins like pears and apples. Whole wheat, especially wheat bran, also contains insoluble fiber.

TYPES OF FIBER

- **Cellulose** is an insoluble fiber found in cereal grains and the cell walls of many fruits and vegetables. It absorbs water and adds bulk to the stool. This can have a laxative effect.
- **Lignins** are an insoluble fiber found in wheat and corn bran, many types of nuts, lentils and beans, flaxseeds, asparagus, garlic, carrots, broccoli, peaches, prunes, and apricots. Lignins add bulk in the colon and have a laxative effect.
- **Beta-glucans** are a soluble fiber found in oats, barley, rye, wheat, nutritional yeast, mushrooms, and seaweed. Beta-glucans are metabolized and fermented in the small intestine (prebiotic).
- **Inulins**, like beta-glucans, inulins are soluble, fermentable, and serve as prebiotics. Inulins are found in onions, bananas, leeks, chicory root, burdock root, dandelion root, fresh garlic, asparagus, and Jerusalem artichokes. Inulins help to bulk stool and have a laxative effect.
- **Pectins** are soluble and highly fermentable (prebiotic). Pectins are found primarily in fruits that include apples, oranges, grapefruits, lemons, apricots, pears, plums, and gooseberries.

STARCH & FIBER: WINTER SQUASH

Squashes are technically a fruit (contains seeds) but we traditionally call them a vegetable. There are dozens of types and they all have many minerals, vitamins, and other phytonutrients with health benefits.

Starchy, and some-what starchy, squashes include butternut, acorn, pumpkin, buttercup, golden hubbard, and the delicious Japanese pumpkin (kabocha squash). Squashes contain a lot of fiber, nutrients, and a low to medium glycemic index rating.



Fiber: winter squashes provides about 6 grams of fiber per cup.

The glycemic index is a ranking system used to measure how quickly foods containing carbohydrates raise blood sugar levels after being consumed. Root type vegetables, including beetroot, rank fairly low (30-40) making them another great option alongside legumes and winter squash.

STARCH & FIBER: ROOT VEGETABLES

Root vegetables include: potatoes, sweet potatoes, yams, beets, parsnips, carrots, fennel, celery root (celeriac), Jerusalem artichokes, radishes, onions, rutabaga, and turnips. Root vegetables contain starch, fiber, and except for potatoes, they tend to have a low to medium glycemic index rating. Potatoes have a very high glycemic index of 82- 111 points.



Amount of Fiber:

- Carrots (cooked): 1 cup has 5 grams
- Sweet Potato: 1 cup has 4 grams
- Beets: 1 cup has 4 grams
- Onion (medium): has 2 grams
- Turnips (cubed): 1 cup has 2.3 grams
- Jerusalem artichokes (sliced): 1 cup has 2.4 grams

As you can see, most root vegetables contain similar amounts of fiber. This will make it easier to determine how much fiber you are getting when you are enjoying your root vegetables.

STARCH & FIBER: LEGUMES

Legumes like peas, chickpeas, lentils, and beans, contain resistant starch. Resistant starch does not affect blood glucose levels. Instead of being broken down and absorbed by the small intestine, resistant starch is moved to the large intestine where it is fermented and consumed by the microbes - it is a prebiotic.

Most legumes contain similar amounts of fiber.

- Baked beans (canned): 1/2 cup has 6.5 grams
- Kidney beans, fresh: 1/2 cup has 8 grams
- Black beans (fresh): 1/2 cup has 7.5 grams
- Lima beans (fresh) : 1/2 cup has 6.5 grams
- Navy and Great Northern beans (canned): 1/2 cup has 6.5 grams



CARBS & FIBER: GRAINS & RICES



- **Long-grain Rice:** one cup contains 3.2 g of fiber and 52 g of carbs (glycemic index is 55)
- **Basmati and Jasmine rice** have a lower glycemic index (45-50) compared to regular white rice but there is only 0.7 grams of fiber.
- **Rolled Oats:** 1/2 cup has 4 g of fiber and 27 g of carbs (glycemic index is 55)
- **Steel-cut Oats:** 1/2 cup has 10 g of fiber and a glycemic index of 42
- **Whole-wheat bread** (one slice) has 1.9 g of fiber and 13 g of carbs (glycemic index is 50-70)

The lowest glycemic index grain is hulled barley (28). Hulled barley also has 16 grams of fiber in 1/2 cup. Pearled barley is not a whole grain but the glycemic index is still low (30).

CARBOHYDRATES

Complex carbohydrates are made up of sugar molecules that are strung together in long, complex chains. They include the sugars, starches and fibers found in fruits, grains, legumes (peas, beans, lentils), and vegetables.



Sugar refers to a family of molecules called saccharides.

Starch = polysaccharides (very long chains of sugars that break down slowly)

Fiber = non-digestible sugar - (human digestive enzymes cannot break the bonds between the sugar molecules)

OLIGOSACCHARIDES

Oligosaccharides contain 3-10 sugar molecules linked together. Foods high in fiber are usually high in oligosaccharides.

Oligosaccharides act as prebiotics, food for our good gut bacteria. The bacteria ferment the long chains of sugar which produces short-chain fatty acids. The short-chain fatty acids reduce inflammation and strengthen the intestinal barrier. This prevents leaky gut syndrome (increased intestinal permeability).

Leaky gut is associated with several inflammatory conditions:

- Inflammatory Bowel Disease (IBD)
- Irritable Bowel Syndrome (IBS)
- Celiac Disease
- Obesity
- Types 1 and 2 Diabetes
- Alzheimer's Disease
- Parkinson's Disease
- Major Depression Disorder
- Autism Spectrum Disorders

Foods that are high in oligosaccharides (prebiotics) include:

- **Vegetables:** tomatoes, yacon, jicama, scallions, white onions, leek, garlic, kale, red cabbage, green cabbage, broccoli, and Jerusalem artichoke
- **Fruit:** nectarines, watermelon, pears, blueberries, sour cherries, mulberries, red currants, raspberries, cantaloupes, figs, and bananas
- **Grains:** wheat and rye
- **Legumes:** all beans, peas, and lentils
- **Herbs:** burdock root, dandelion root, chicory root



Burdock, chicory, yacon, and Jerusalem artichoke belong to the Asteraceae family. The roots from this family have low starch levels and high amounts of oligosaccharides (long chains of fructose molecules -fructans).

Monosaccharides have one sugar molecule and include glucose, fructose, and galactose.

- **Glucose** is able to cross the blood brain barrier and it provides an energy source for the brain.
- **Fructose** is commonly found in honey, fruits, and vegetables. Fructose is broken down in the liver and does not tend to spike blood sugar levels. This does not include high-fructose corn syrup!
- **Galactose** is very high in garbanzo beans, kidney beans, and lentils. It is also found in blueberries, papaya, watermelon, broccoli, Brussel sprouts, carrots, tomatoes, and many more whole foods.

Disaccharides have two sugar molecules linked together.

- **Glucose + Glucose = Maltose:** Heat during cooking or canning converts starch into maltose which makes the food sweet (sweet potatoes). There are only a few uncooked foods that contain maltose: molasses, spelt, and gamut are the most common. Barley malt syrup, brown rice syrup and corn syrup are high in malt sugar.
- **Fructose + Glucose = Sucrose:** it is called table sugar but it is also found in fruits and vegetables. Sugarcane, sugar beets, and maple syrup have the highest quantity of sucrose.
- **Galactose + Glucose = Milk Sugar** is a disaccharide found in all mammal milk.

HONEY



Raw honey is 80–85% sugar (50% fructose, 44% glucose, 4% galactose, and 2% maltose) so it should be used with moderation (2-3 tablespoons a day).

The phenolic acids and flavonoids in honey are responsible for its antioxidant, anti-inflammatory, and antimicrobial, and wound healing properties.

While honey may not work for everyone it is a delicious way to help with the following:

- Acute nighttime coughs when someone has an upper respiratory infections - especially eucalyptus honey, citrus honey, and Lamiaceae honey.
- To help relieve inflammation in the stomach or intestines causing diarrhea.
- Rehydration
- May help with depression, anxiety, and memory disorders.
- Topically to heal wounds and burns.

HONEY



“The amount of antioxidants in honey depends on several factors such as harvest season, humidity, the type of bee and most importantly, the type of plants that the bee fed on. The vegetable origin of honey is considered the most determining parameter for the amount of antioxidants in honey”.

<https://www.nature.com/articles/s41598-023-51099-9>

MAPLE SYRUP

Maple syrup is 96% sucrose (fructose bound to glucose) and like honey it should be used with moderation (2-3 tablespoons a day). It has many antioxidant phenolics, minerals, organic acids (malic acid, fumaric acid, etc.), amino acids, phytohormones (abscisic acids), and vitamins (niacin, thiamine, riboflavin, etc.).

RDA for 1/4 cup serving of maple syrup: Manganese 100%, Riboflavin (vitamin B2) 34%; Zinc 11%; Calcium 6%. It is also high in potassium.



Maple syrup is rich in abscisic acid. This acid presents a strong defense against diabetes and metabolic syndrome because it **promotes the excretion of insulin from pancreatic cells and boosts fat cells' sensitivity to insulin.** <https://pmc.ncbi.nlm.nih.gov/articles/PMC10469071>

THANK YOU FOR JOINING OUR LECTURE SERIES!

Sweet Potato Brownies



1 cup cooked mashed
sweet potato



1/4 cup cocoa powder



1/2 cup nut butter



1/4 cup maple syrup

Combine in a food processor,
place in a small pan and cook
for 12-15 minutes at 350°F.

FOOD MATTERS®

