



Nutrition & Health

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A healthy eating plan provides the daily nutrients and calories required for optimal health while avoiding as many toxins as possible. Everyone will always need proteins, fats, fiber carbohydrates, vitamins, minerals, water, and a positive attitude towards food. Most foods contain a mixture of proteins, fats, and carbohydrates and each food source provides a variety of vitamins, minerals, and phytochemicals needed for our cells. Some foods, like legumes, have many minerals and vitamins but because of “anti-nutrients” we are unable to absorb and use the nutrients without proper processing/cooking.

The word diet comes from Old French *diète* and Medieval Latin *dieta* meaning "a daily food allowance". When we use the word diet it usually refers to eating by means of following a plan. There are hundreds of diets. Most diets are designed to correct a problem: weight loss, weight gain, lowering sugar and cholesterol levels, building muscle, controlling inflammation, helping with ADHD, autism and many other conditions.

As natural health professionals we need to help each client choose the foods that are needed at that time. As an example, some clients may need a low-fat diet for at least few months while they are following a bowel and liver protocol. Those that experience upset stomachs after eating fatty meals, have had years of SAD diets (leads to fatty livers), have insufficient bile or gall bladder issues, are very overweight, etc. will benefit from a low-fat diet. After the protocol they should slowly add in healthy fat. Omega-3s are often lacking so a supplement should be used while on the low-fat diet. Each client will need a diet that supports their particular healing process.

Choosing a diet to maintain good health is dependent upon the person's ability to digest and metabolize the food ingested as well as how they feel (energy, aches and pains, bloated, etc.) after they eat a meal. Food should support the person's lifestyle (athlete, sedentary, travel, office worker, manual labor, etc.) with plenty of nutrients at the cellular level. Food should also be an enjoyable experience and a natural part of life.

There are many diets but most can be categorized by as low-fat, high-fat, low-carbohydrate, low-glycemic, high-carbohydrate, high-protein, low-calorie, and vegetarian. I have, and will continue to get criticism, for not recognizing veganism as a diet.

Veganism is more of a way of life and a philosophy than a diet. If a healthy person must take supplements because of their food choices, the “diet” is not sufficient to meet cellular needs and should be rejected as a long-term "diet". Anyone who eliminates processed foods and chemicals and eats vegetables and fruits will have improvement, sometimes drastic improvement in a short time. The question is if the diet supports all cellular needs after the nutrients stored in the organs and tissues have been depleted.

Some Popular Diet Summaries

I am not advocating the use of any diet listed. The purpose of the list is to show the various types of diets being promoted. Daily food choices should support the individual's needs.

Consuming a **SAD (Standard American Diet)** is not a goal. Most people know they need various food groups like vegetables and fruit but, food preferences, availability, lifestyles, work schedules, cooking experience, money, nutritional education, and other factors play a large role in determining what they actually eat on a regular basis. In addition, some do not give food any real consideration beyond feeling full. The consequences are far-reaching and long-lasting. Fixing the imbalances takes more than just changing the diet. You must also fix the damage it caused to the liver, bowels, pancreas - every cell in the body.



The **Mediterranean Diet** emphasizes the consumption of primarily plant-based foods, such as fruits and vegetables, whole grains, legumes and nuts, moderate amounts of fish, poultry, and red wine. This diet also recommends replacing butter with fats such as olive oil and canola oil and using herbs and spices instead of salt to flavor foods.

The **Atkins Diet** emphasizes eating lean protein, low-starch vegetables, avoiding simple carbohydrates like flour and sugar. The goal is to reduce the glycemic load to keep blood sugar levels in a healthy range which allows your body to burn greater amounts of fat.

The **Ketogenic Diet** involves drastically reducing carbohydrates and replacing them with fat. The goal is to put your body into the metabolic state called ketosis. In this state the body will burn fat for energy and turn fats into ketones in the liver which can supply the energy required by the brain. According to Healthline Media here are several versions of the ketogenic diet. The standard ketogenic diet (SKD) is a very low-carb, moderate-protein and high-fat diet (75% fat, 20% protein and only 5% carbs). The cyclical ketogenic diet (CKD) includes periods of higher-carb (example: 5 ketogenic days followed by 2 high-carb days). The targeted ketogenic diet (TKD) which allows you to add carbs around workouts and the high-protein ketogenic diet. The high-protein ketogenic diet is about 60% fat, 35% protein and 5% carbs.

The **Paleo Diet** (also called caveman diet, primal diet, Stone Age diet, and hunter-gatherer diet) is very popular right now. What would a caveman eat? Anything that a person could hunt or find – meat, fish, nuts, leafy greens, regional veggies, and seeds. Grains/crop foods and livestock ownership are considered modern so grass-fed beef is suggested. It has been estimated that Paleolithic people obtained about 35% of their calories from fats, 35% from carbohydrates, and 30% from protein. ⁽¹⁾

Macrobiotic Diet, macrobiotic means “long life”, is primarily vegetarian (mostly grains and vegetables), with some fish and seafood. Balancing Yin and Yang foods is the focus of the macrobiotic diet. Yin foods are said to be “passive” and include cold foods and sweets. Yang foods are considered more “aggressive” like warm and/or salty foods.

The **Zone Diet**, by restricting grains and starches and maximizing fruits and vegetables, claims to control diet-induced inflammation. They claim that it is inflammation that disrupts the hormonal communication in our cells.

The **South Beach Diet** is supposed to help people lower their risk of developing heart disease. The goal is to replace "bad carbs" with "good carbs" and "bad fats" with "good fats." No refined sugars and processed grains but many vegetables, beans, and whole grains. Saturated fats are supposed to be replaced with vegetable oils and omega-3 rich foods like salmon and avocado.



Vegetarian diets vary but it usually means that a person does not eat meat and they eat many vegetables. Vegetarians do eat eggs and other products from animals and some include fish or chicken. Some people claim to be a vegetarian but they should really be called a carbotarian. The idea that not eating meat is healthy while they fill up on many servings of grains, fake meat, and soy-based fast food is not wise. Never assume that a person is eating healthy just because they say they are vegetarians.

The **Raw Food** diet is made up of fresh, whole and unrefined fruits, vegetables, leafy greens, nuts, and seeds. They are consumed in their natural state, without cooking or steaming. Not all raw food diets are the same. Most of them are designed to obtain a high percentage of daily calories from fats (avocado, nuts and seeds). Others emphasize the use of primarily vegetables which may result in insufficient calories. To offset the problems with the high fat or insufficient calories some raw food supporters say that a sustainable raw foods diet includes a large amount of fruit for the daily calories along with liberal amounts of vegetables and small amounts of nuts and seeds.

The **Blood Type** diet advises people to eat certain foods based on their blood type: A, B, AB, or O. They claim that each blood type reacts with food proteins/lectins differently. **The diet is based on the author’s theory of evolution.** The author claims that basically, group O is considered ancestral, the first blood group to evolve in humans, so their diet should resemble that of the hunter-gatherer. Group A should have a vegetarian diet because this blood group evolved when humans settled into agricultural societies. Blood group B should consume dairy products because this blood group was believed to originate in nomadic tribes. I have found no research that would support the author’s theory of evolution and its connection to blood type and diet.

Some Popular Diet Summaries for Specific Illness/Conditions

In addition to diet changes, I recommend using a liver and bowel protocol to eliminate the overgrowth of bacteria, parasites, and candida. A natural food-based multivitamin/mineral would help restore the possible missing nutrients from either malabsorption caused by bowel inflammation or a diet lacking in vegetables and fruits. Diet alone can take months or years to correct diet related conditions.

Feingold Diet for ADHD: This diet eliminates certain chemicals and helps identify food intolerances. The elimination of artificial colors (primarily Yellow No. 5, Red No. 40, Green No. 3 and Blue No. 2), artificial sweeteners (acesulfame-K, aspartame, saccharin and sucralose), three preservatives (BHA, BHT and TBHQ), and a substance called salicylate is the first step. Some children are sensitive to dyes, while others are sensitive to artificial sweeteners, and of course some are sensitive to both. Chemical names of the preservatives are butylated hydroxyanisole/BHA; butylated hydroxytoluene/BHT; and tert-butylhydroquinone/TBHQ.

Salicylates are a family of plant substances found naturally in a variety of fruits, vegetables, nuts, and herbs. The foods eliminated include almonds, apples, apricots, berries, cucumbers, pickles, plums, oranges, peaches, tomatoes, tangerines and grapes. These foods are reintroduced to determine if the child has a salicylate intolerance.

Examples of allowed fruits and vegetables include bananas, cantaloupe, dates, grapefruit, kiwi, mangoes, papaya, pineapple and watermelon, beans, broccoli, beets, cabbage, brussels sprouts, cauliflower, kale, lentils, potatoes, mushrooms and celery.

“Artificial food colors (AFCs) have not been established as the main cause of attention-deficit hyperactivity disorder (ADHD), but accumulated evidence suggests that a subgroup shows **significant symptom improvement** when consuming an AFC-free diet and reacts with ADHD-type symptoms on challenge with AFCs. Of children with suspected sensitivities, 65% to 89% reacted when challenged with at least 100 mg of AFC.

Oligoantigenic diet studies suggested that some children in addition to being sensitive to AFCs **are also sensitive to** common nonsalicylate foods (milk, chocolate, soy, eggs, wheat, corn, legumes) as well as salicylate-containing grapes, tomatoes, and orange. Some studies found "cosensitivity" to be more the rule than the exception.

Recently, 2 large studies demonstrated behavioral sensitivity to AFCs and benzoate in children both with and without ADHD. A trial elimination diet is appropriate for children who have not responded satisfactorily to conventional treatment or whose parents wish to pursue a dietary investigation.”

Clin Pediatr (Phila). 2011 Apr;50(4):279-93. doi: 10.1177/0009922810384728. Epub 2010 Dec 2. Dietary sensitivities and ADHD symptoms: thirty-five years of research. Stevens LJ1, Kuczek T, Burgess JR, Hurt E, Arnold LE.

NOTE: I find it very sad that an elimination diet is not used or considered by the pediatricians unless the highly destructive drugs do not work.

Gut & Psychology Syndrome (GAPS Diet): According to Dr Natasha Campbell-McBride, MD, MMedSci (neurology), MMedSci (human nutrition), GAPS is a condition which establishes a connection between the functions of the digestive system and the brain. This term was created after working with hundreds of children and adults with neurological and psychiatric conditions, such as autistic spectrum disorders, attention deficit hyperactivity disorder (ADHD/ADD), schizophrenia, dyslexia, dyspraxia, depression, obsessive–compulsive disorder, bi-polar disorder and other neuro-psychological and psychiatric problems.

Dr. Natasha Campbell-McBride states, “The purpose of the treatment is to detoxify the person, to lift the toxic fog off the brain to allow it to develop and function properly. In order to achieve that we need to clean up and heal the digestive tract, so it stops being the major source of toxicity in the body and becomes the source of nourishment, as it is supposed to be. As more than 90% of everything toxic floating in our blood (and getting into the brain) comes from the gut, healing it will drop the level of toxicity in the body dramatically.”

NOTE: The GAPS diet has great results but, do keep in mind that some people are sensitive or allergic to milk-based yogurt even if it is raw. Not every parent can follow everything in the plan so it may need to be modified a little. Again, diet alone takes too long! Use your knowledge of herbs and supplements.

Elaine Y. Hsiao, PhD, states that, “A preponderance of evidence suggests that a significant subset of autistic individuals exhibit GI abnormalities and that GI issues can contribute to the clinical manifestations of ASD-associated symptoms, including abnormal behavior, immune dysregulation, and metabolic dysfunction.”⁽²⁾ Autism Spectrum Disorders (ASD)

According to the research article, *Markers of Celiac Disease and Gluten Sensitivity in Children with Autism*, “A subset of children with autism displays increased immune reactivity to gluten, the mechanism of which appears to be distinct from that in celiac disease. The increased anti-gliadin antibody response and its association with GI symptoms points to a potential mechanism involving immunologic and/or intestinal permeability abnormalities in affected children.”⁽³⁾

Gerson Therapy: Developed by Dr. Max Gerson in the 1920s, the Gerson Therapy uses plant-based organic foods, juicing, detoxification methods (enemas and nutrients), and supplements (iodine, potassium, and more). The therapy is based on the idea that cancer develops when there are changes in cell metabolism because of the buildup of toxins and/or if the cells have too much sodium and too little potassium. The goal is to restore the body to health by repairing the liver and returning the metabolism to its normal state.

The Gerson Institute states, “The Gerson Therapy regenerates the body to health, supporting each important metabolic requirement by flooding the body with nutrients from about 15-20 pounds of **organically-grown** fruits and vegetables daily. Most is used to make fresh raw juice, up to one glass every hour, up to 13 times per day. Raw and cooked solid foods are generously consumed. Oxygenation is usually more than doubled, as oxygen deficiency in the blood contributes to many degenerative diseases. The metabolism is also stimulated through the addition of thyroid, potassium and other supplements, and by avoiding heavy animal fats, excess protein, sodium and other toxins.”



Current research strongly suggests that at least 30% of all cancer cases are linked to poor dietary habits. In addition, diet is implicated in 70% of gastrointestinal tract cancer cases. This means that 70% of intestinal cancer and 30% of all cancer cases are preventable.⁽⁴⁾

Metabolic Therapy/Ketogenic Diet: Dr. D'Agostino claims that a ketogenic diet can have a rapid effect on cancer. All of our cells, including cancer cells, use glucose for energy but only healthy cells are able to use ketone bodies. Ketone bodies are produced when the body burns fat for energy so the diet eliminates carbohydrates and replaces them with healthy fats. The elimination of carbohydrates lowers blood glucose and insulin levels while ketone levels rise. The healthy cells of the body will switch to using fat and ketones for energy. This is called “nutritional ketosis”, a controlled process that results in a mild release of fatty acids and ketone body production. Some confuse the name ketogenic with ketoacidosis. Ketoacidosis is a dangerous condition and the result of insufficient insulin in the body.

The authors of the research paper titled, *Ketone supplementation decreases tumor cell viability and prolongs survival of mice with metastatic cancer* state that, “Previously, the anticancer effects of these dietary manipulations have largely been attributed to decreased circulating blood glucose, which limits energy substrates for cancer cells. New evidence suggests, however, that the physiological state of ketosis and elevated circulating ketones also have anticancer effects.”⁽⁵⁾

Allen BG, Bhatia SK, Anderson CM, et al. Ketogenic diets as an adjuvant cancer therapy: History and potential mechanism. *Redox Biology*. 2014;2:963-970. doi:10.1016/j.redox.2014.08.002.

Clinical applications of ketogenic diet

Increased recognition of the safety and efficacy of using ketogenic diets in the treatment of epilepsy has resulted in successful application of this dietary intervention to other disorders. The most notable and well-studied use of a ketogenic diet is for the treatment of obesity popularized by Dr. Robert Atkins (*Dr. Atkins Diet Revolution* 1972). Ketogenic diets have also been shown to be beneficial in the treatment of patients with glucose transporter defects and other inborn metabolic disorders. The diet is reported to show promise in slowing the progression of amyotrophic lateral sclerosis, and there is a growing body of evidence suggesting ketogenic diets may be beneficial in other neuro-degenerative diseases including Alzheimer’s disease and Parkinson’s disease. In addition, there are case reports and small case studies indicating improvement in patients with autism, depression, polycystic ovary syndrome, and type 2 diabetes mellitus.

Ketogenic diets in cancer therapy

Recently, ketogenic diets have been studied as an adjuvant to cancer therapy in both animal models and human case reports. As early as 1987, Tisdale et al. saw decreased tumor weight and improved cachexia in mice with colon adeno-carcinoma xenografts eating a ketogenic diet. Additional studies have shown that ketogenic diets reduce tumor growth and improve survival in animal models of malignant glioma, colon cancer, gastric cancer, and prostate cancer...Fasting, which also induces a state of ketosis, has been shown to enhance responsiveness to chemotherapy in pre-clinical cancer therapy models as well as possibly ameliorating some of the normal tissue side effects seen with chemotherapy. Fasting cycles are also reported to retard the growth of tumors and sensitize a range of cancer cell types to chemotherapy.”

What Is A Balanced Diet?

A few minutes on the internet will reveal that a balanced diet depends on what a person has accepted as fact. I will not make any claims about being an expert on the metabolism of all foods across all states of health and lifestyles. I do believe that if we “listen” to our bodies (pain, bloating, gas, weight gain, pain, skin health, etc.) and choose foods in their natural forms for most meals we would be covering at least 80% of our needs.

How much protein, fat, and carbohydrates should a person consume if they are healthy?

A healthy person needs what I call a maintenance diet. A diet that will support that person's lifestyle by providing all the nutrients needed by the cells. If a person's lifestyle is very physical in all aspects (physical labor and they work out more than 3 times a week) they will likely require more protein, fat, and nutrients than the person who works out 3 times per week but has a very sedentary job. The person who has a mentally challenging job that is high stress will require more B vitamins than the person who has a slower-paced job (or perceives their work as low to moderate stressful).

Protein

The Recommended Dietary Allowance (RDA) for protein is only 0.8 grams of protein per kilogram of body weight. To determine your RDA for protein, you can multiply your weight in pounds by 0.36. Based on the RDA a person that weighs 120 lbs. needs 43.2 grams of protein.

Nancy R Rodriguez from the Department of Nutritional Sciences states: “Emerging science supports a protein intake for adults of 25–30 g/meal and ≥ 2.2 g of the essential amino acid leucine to achieve maximal muscle protein synthetic rates. Because physical activity enhances muscle protein synthesis, the researchers suggest that protein recommendations be linked to physical activity.”⁽⁷⁾



Medical-based health professionals recommend that 10 and 35 percent of your total calories should come from protein. A quick look at some approximate grams of protein from food sources and it is easy to see why meat is highly valued in our diets. Spirulina is also very high but it is hard to eat 1/2 cup of dried (shrinks a lot) on a daily basis.

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?

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

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

Protein

Amount	Food Source	Approximate Grams
1/2 cup	Seaweed, spirulina, dried	32
3 ounces	Steak	23
3 ounces	Tuna, Salmon, Haddock, Trout	21
3 ounces	Turkey, Chicken, Hamburger	19
6 ounces	Greek yogurt	17
1/2 cup	Cottage cheese	14
1 ounce	Swiss cheese	8
1/4 cup	Nuts: cashew, hazelnut, walnut, almonds, etc.	7
1/2 cup	Cooked beans: green peas, kidney beans, black beans, etc.	5-7
1	Egg	6
1 cup	Cooked: Wheat Pasta, Quinoa, Brown Rice, Wild Rice	6-8
1 cup	Cooked Brown rice	5.5
1/2 cup	Cooked: Brussel sprouts, spinach, collards, asparagus, squash, sweet potatoes, broccoli, tomatoes, and most other vegetables	2-3

Source: USDA National Nutrient Database, 2017

Proteins in the Body

The name protein comes from the Greek word *protos*, which means “first.” Proteins are long chains of molecules made up of hundreds of smaller units called amino acids. Proteins exist in a folded state and require specific enzymes to break them down into smaller units that can be used in the body. Our DNA determines which proteins will be made from the amino acids. All of our cells contain the same DNA molecules, but each cell uses a different combination of genes to build the specific proteins it needs to carry out its activities.



Proteins provide structure, function, and regulation of the body's tissues and organs. Hair, nails, and the outer layers of skin are made of the protein keratin. Muscle tissue contains myosin, actin, myoglobin, and other proteins. The outer part of bone is hardened with minerals such as calcium, but the inner structure is protein. Red blood cells contain hemoglobin, a protein that carries oxygen throughout the body. Plasma contains fat and protein particles known as lipoproteins. Neurotransmitters require proteins. Hormones are proteins and peptides. Cells contain thousands of different enzymes. Enzymes are specialized proteins that are catalysts for virtually all the chemical reactions within cells and throughout the body.

Adults can produce 9 (some say 10, others say 11) of the 20 amino acids needed by the body. The 9 amino acids that we can produce are alanine, asparagine, aspartic acid, cysteine, glutamic acid, glutamine, glycine, proline, serine and tyrosine. Tyrosine is produced from phenylalanine, so if the diet is deficient in phenylalanine it will also be deficient in tyrosine. Arginine used to be considered essential for adults. It is now considered conditionally essential, only needed when there are certain disease conditions and in premature infants.

The essential amino acids, the ones we must consume, are histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine. The human body does not store excess amino acids for later use so the amino acids must be consumed every day.

The list below includes a brief overview of the essential amino acids and arginine. While they are listed separately, they do not function in isolation. If a person is low in one they are often low in other essential amino acids.

Arginine is converted into nitric oxide (NO) in the cells that line the entire circulatory system (vascular endothelial cells). NO is a highly reactive free radical that is released to relax blood vessels. This action increases oxygen and improves circulation throughout the body. NO is also a messenger molecule that stimulates the release of several neurotransmitters and neuroactive amino acids. ⁽⁸⁾ Neuroactive simply means that a substance stimulates neural tissue.

As a free radical, NO is able to both **stimulate and inhibit** lipid peroxidation (free radicals "steal" electrons) in cell membranes. Lipid peroxidation results in cell damage without sufficient antioxidants, especially vitamins E and C.

Both arginine and nitric oxide are important in bone health. Nitric oxide is a regulator of bone turnover in humans and arginine is crucial for the production of collagen and the maintenance of bone.⁽⁹⁾ Collagen is a protein that supports connective tissues (such as cartilage) and bone.

Arginine is also involved in ammonia detoxification and the immune system. According to MayoClinic.org, "Arginine may cause low blood pressure. Avoid use in those with low blood pressure or those using blood pressure-lowering agents."

Histidine is a very active with multiple roles in protein and enzyme actions. As part of the carnosine (β -alanyl-L-histidine) dipeptide it has anti-inflammatory, antioxidant, and anti-ischemic actions. **Ischemia** is a restriction of the blood supply to tissue which may result in tissue death.

Histidine is the precursor for histamine which is needed for the function of immune cells. Excessive releases of histamine from mast cells results in allergy symptoms (dilation of capillaries and larger blood vessels, swelling, itching, etc.).

An insufficient supply of histidine, or the loss of histamine in the urine because of a folate deficiency, causes anemia.⁽¹⁰⁾ Histidine deficiency may result in eczema, joint stiffness, muscle pain, and rheumatoid arthritis. Histidine supplements should be taken with zinc and copper. Histidine may cause rapid zinc excretion. Histamine also acts as a neurotransmitter and is involved in the production of gastric acid.

Isoleucine, Leucine, and Valine are the three branched chain amino acids (BCAA). While most amino acids are oxidized (removal of electron(s)) in the liver, BCAAs are primarily oxidized in the muscles and peripheral tissues. BCAAs are involved in the normal growth and repair of tissues, regulating blood sugar, and in the brain they have a role in the production of neurotransmitters and energy.

BCAAs are useful in anorexia, malnourishment, liver disease, and the movement disorder called tardive dyskinesia. The amino acids leucine, isoleucine, and valine are also used to reduce symptoms of mania. Valine appears to be needed for proper mental functioning. BCAAs may play a role in treating hepatic encephalopathy, a brain disorder caused by a buildup of toxins in the blood.⁽¹²⁾

Lysine is primarily known for the prevention and treatment of herpes infections, cold sores, heat blisters, and boosting the immune system. Like all amino acids, the body uses lysine to build muscle and other tissues but it also has a role in osteoporosis. Lysine increases the intestinal absorption of calcium and prevents its excretion through the kidneys. Studies suggest that lysine in combination with L-arginine activates the bone-building cells and elevates the production of collagen.⁽¹¹⁾ It appears that lysine also supports mood and serotonin levels and may help prevent migraine headaches.

According to drugs.com, "Proteins derived from grains such as wheat and corn tend to be low in lysine content. The bioavailability of lysine is reduced with food preparation methods, such as heating foods in the presence of a reducing sugar (fructose or glucose); heating foods in the presence of sucrose or yeast; and cooking in the absence of moisture at high temperatures. The average 70 kg human requires 800 to 3,000 mg of lysine daily".

Methionine is a sulphur-containing amino acid which plays a central role in the synthesis of other proteins. Almost all foods (plant or animal) containing protein also contain L-methionine. High temperatures can denature methionine and soaking too long or boiling will result in leaching. Brazil nuts, sesame seeds, and beef are the best known sources of methionine.

Methionine is useful in reducing fat deposits in the liver and it is required for healthy cartilage in the joints. Studies have shown that the cartilage from healthy people contains approximately three times more sulphur than in arthritis patients. Methionine is also important in angiogenesis, the growth of new blood vessels. Angiogenesis is a normal process of wound healing and growth and development but, tumors can take advantage of this process. Tumors require a blood supply to become invasive and transition to malignant tumors.

Methionine supplements are useful in the prevention of liver damage during acetaminophen (Tylenol) poisoning, copper poisoning, and radiation side effects. Methionine is also used for **increasing the acidity of urine**, treating liver disorders, and improving wound healing. S-adenosyl methionine (S-adenosyl methionine) is an antioxidant best known for its use as an antidepressant. The role of S-adenosyl methionine in liver health has been the focus of several studies but they have been small and some used intravenous S-adenosyl methionine. It is noted that S-adenosyl methionine may reduce symptoms of liver disease and normalize bilirubin and liver enzyme levels. (www.umm.edu/health/medical/altmed/condition/cirrhosis)

Phenylalanine is converted to tyrosine. Tyrosine is required to make proteins, L-dopa, epinephrine, and norepinephrine. The thyroid gland combines tyrosine and iodine to make the thyroid hormones triiodothyronine (T₃) and thyroxine (T₄). Under stress, the body may not make enough tyrosine from phenylalanine. Some studies suggest that tyrosine supplements may help improve memory and performance under psychological stress.

Phenylketonuria (PKU) is a rare metabolic disorder caused by a deficiency of the enzyme phenylalanine hydroxylase. High levels of phenylalanine build up in the blood which may cause brain damage, intellectual disabilities, behavioral symptoms, hyperactivity with autistic behaviors, or seizures. If it is not treated before 3 weeks of age, PKU can cause severe, irreversible intellectual disability. In the United States, newborns are tested for PKU within 48 to 72 hours.

Threonine is primarily found in animal protein such as wild game, beef, poultry, and fish, and dairy products, especially cottage cheese. Vegetable sources with high levels of threonine include watercress, seaweed, spinach, turnip greens, sprouted alfalfa seeds, and kidney beans.

Threonine plays an essential role in the production of collagen and elastin in the skin. It is found in high concentrations in the heart, skeletal muscles, central nervous system. In the digestive tract it is needed to produce the protective mucus layer. The thymus gland uses threonine to produce antibodies for immune functions. Threonine is also the precursor to the amino acid glycine which is essential for many muscle, cognitive and metabolic functions.

Tryptophan is an amino acid needed for normal growth in infants, nitrogen balance, and the production of niacin and serotonin. The liver can synthesize niacin from the essential amino acid tryptophan but the body needs adequate amounts of iron, riboflavin, and vitamin B6.⁽¹³⁾ Tryptophan is also converted into 5-hydroxytryptophan (5-HTP). 5-HTP is converted into serotonin.

5-HTP supplements raise serotonin levels in the brain which helps stabilize anxiety and depression disorders, improve sleep, control appetite (over and under-eating patterns), and pain sensation. As a supplement, 5-HTP is made from the seeds of *Griffonia simplicifolia*, a woody shrub native to West Africa and Central Africa.

“Preliminary studies indicate that 5-HTP may work as well as certain antidepressant drugs to treat people with mild-to-moderate depression. Like the class of antidepressants known as selective serotonin reuptake inhibitors (SSRIs), which includes fluoxetine (Prozac) and sertraline (Zoloft), 5-HTP increases the levels of serotonin in the brain. One study compared the effects of 5-HTP to fluvoxamine (Luvox) in 63 people and found that those who were given 5-HTP did just as well as those who received Luvox. They also had fewer side effects than the Luvox group. However, these studies were too small to say for sure if 5-HTP works... (<http://www.umm.edu/health/medical/altmed/supplement/5hydroxytryptophan-5htp>)

Legumes as a source of protein

Beans, peas and lentils are part of the legume family. Many types of beans are nutritious when they are prepared correctly. Some types of beans have more protein than others, but beans for the most part are considered a high-protein food. A half cup of beans provides about 5-9 grams of protein.

Legumes naturally have antinutrients but there are ways to minimize them. Antinutrients are not only found in legumes. Wheat, nuts, and even seeds contain some properties that interfere with nutrient absorption or digestion. Natural ways to decrease the antinutrients include soaking, fermentation, and sprouting/germination.

It takes 16 hours to soak beans correctly (changing the water once or twice is highly recommended) and the beans need to be rinsed after soaking. Soaking significantly decreases antinutrients such as phytic acid, tannins, phenols, α -amylase and trypsin inhibitors.



Fermentation is a process in which food is either exposed to bacteria, yeasts, and molds naturally or by inoculation. Vegetables, bread, yogurt, wine, beer, kombucha, and cheese are common fermented foods. Not everyone can eat fermented foods (or some of them) and it may be related to the histamine content or a mold or yeast allergy.

If the fermentation process uses yeast it may interfere with a Candida cleansing protocol or cause a flareup of symptoms. Fermented milk cultures containing lactic acid bacteria may help those who suffer from allergies or Candida.

“In fermented foods, lactic acid bacteria (LAB) display numerous antimicrobial activities. This is mainly due to the production of organic acids, but also of other compounds, such as bacteriocins and antifungal peptides. Several bacteriocins with industrial potential have been purified and characterized. The kinetics of bacteriocin production by LAB in relation to process factors have been studied in detail through mathematical modeling and positive predictive microbiology. Application of bacteriocin-producing starter cultures in sourdough (to increase competitiveness), in fermented sausage (anti-listerial effect), and in cheese (anti-listerial and anti-clostridial effects), have been studied during in vitro laboratory fermentations as well as on pilot-scale level. The highly promising results of these studies underline the important role that functional, bacteriocinogenic LAB strains may play in the food industry as starter cultures, co-cultures, or bioprotective cultures, to improve food quality and safety. In addition, antimicrobial production by probiotic LAB might play a role during in vivo interactions occurring in the human gastrointestinal tract, hence contributing to gut health. (De Vuyst L, Leroy F., Bacteriocins from lactic acid bacteria: production, purification, and food applications. *J Mol Microbiol Biotechnol.* 2007;13(4):194-9.)

Soybeans

Soybeans, even organic or non-GMO, must be highly processed to be used as a food source. Even with processing they still have many drawbacks when used on a regular basis. The following research papers offer some insight into the antinutrient issues.

“More than half of the world populations are affected by micronutrient malnutrition and one third of world’s population suffers from anemia and zinc deficiency, particularly in developing countries. Iron and zinc deficiencies are the major health problems worldwide. Phytic acid is the major storage form of phosphorous in cereals, legumes, oil seeds and nuts. **Phytic acid is a known food inhibitor. It chelates micronutrient and prevents them from being bioavailable for monogastric animals, including humans**, because they lack enzyme phytase in their digestive tract. Several methods have been developed to reduce the phytic acid content in food and improve the nutritional value of cereal which becomes poor due to such antinutrient. These include genetic improvement as well as several pre-treatment methods such as fermentation, soaking, germination and enzymatic treatment of grains with phytase enzyme.” (Gupta RK, Gangoliya SS, Singh NK. Reduction of phytic acid and enhancement of bioavailable micronutrients in food grains. *Journal of Food Science and Technology*. 2015;52(2):676-684. doi: 10.1007/s13197-013-0978-y.)

“Dietary protein quality is considered to be dependent on the degree and velocity with which protein is digested, absorbed as amino acids, and retained in the gut as newly synthesized protein. Metabolic animal studies suggest that the quality of soy protein is inferior to that of casein protein...In conclusion, **a significantly larger portion of soy protein is degraded to urea**, whereas casein protein likely contributes to splanchnic utilization (probably protein synthesis) to a greater extent. **The biological value of soy protein must be considered inferior to that of casein protein in humans.**” (Luiking YC, Deutz NE, Jäkel M, Soeters PB, Casein and soy protein meals differentially affect whole-body and splanchnic protein metabolism in healthy humans. *J Nutr*. 2005 May;135(5):1080-7)

“The heating process during conventional soy milk making considerably destroys most of the anti-nutritional factors in soy milk and improves the digestibility of soy protein, as well. **However, compounds, like phytic acid, which interferes with the availability of calcium, is not reduced effectively.** At the same time, over-heating to eliminate trypsin inhibitor activity to a great extent can cause **damage to amino acids, as well as loss in the overall nutritional value of soy milk.**” (Susu Jiang , Weixi Cai, Baojun Xu, Food Quality Improvement of Soy Milk Made from Short-Time Germinated Soybeans. *Foods* 2013, 2(2), 198-212; doi:10.3390/foods2020198)

“The effect of reducing the phytate in soy-protein isolates on nonheme-iron absorption was examined in 32 human subjects...Even relatively small quantities of residual phytate were strongly inhibitory and phytic acid had to be reduced to less than 0.3 mg/g of isolate before a meaningful increase in iron absorption was observed. **However, even after removal of virtually all the phytic acid, iron absorption from the soy-protein meal was still only half that of the egg white control.** It is concluded that phytic acid is a major inhibitory factor of iron absorption in soy-protein isolates but that other factors contribute to the poor bioavailability of iron from these products.” (RF Hurrell, MA Juillerat, MB Reddy, SR Lynch, SA Dassenko, and JD Cook, Soy protein, phytate, and iron absorption in humans. 1992 by The American Society for Clinical Nutrition, Inc)

“The findings did not support our a priori hypothesis. **Instead, this pilot study indicates that prolonged consumption of soy protein isolate has a stimulatory effect on the premenopausal female breast**, characterized by increased secretion of breast fluid, the appearance of hyperplastic epithelial cells, and elevated levels of plasma estradiol. These findings are suggestive of an estrogenic stimulus from the isoflavones genistein and daidzein contained in soy protein isolate.” (Petrakis NL, Barnes S, King EB, Stimulatory influence of soy protein isolate on breast secretion in pre- and postmenopausal women. *Cancer Epidemiol Biomarkers Prev.* 1996 Oct; 5(10):785-94.)

Fats/Lipids

The American Heart Association suggests that healthy adults limit dietary fat to no more than 20 to 35 percent of total daily calories. Most dietary guidelines recommend keeping saturated fat to less than 10 percent of calories a day. For a 2,000-calorie-a-day diet, that's 200 calories or about 22 grams of saturated fat as a maximum.

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

To determine how many fat grams or calories you need or are consuming, start with the number of calories you normally eat or want to eat each day. Multiply that number by the recommended percentages to get the range of fat calories.

Here's an example for total fat based on a 2,000-calorie-a-day diet.

- Multiply 2,000 by 0.20 (20 percent) to get 400 calories.
- Multiply 2,000 by 0.35 (35 percent) to get 700 calories.

How many fat grams? There are 9 calories in a gram of fat, so you divide the number of calories by 9.

- Divide 400 calories by 9 (calories a gram) to get about 44 grams of fat.
- Divide 700 calories by 9 (calories a gram) to get about 78 grams of fat.

If you are consuming 2,000 calories per day, 400 to 700 calories should come from dietary fat, which translates to between 44 and 78 fat grams a day. There are 1,000 mg per 1 gram: $6,938 \text{ milligrams (mg)} = 6.938 \text{ grams}$



“A ketogenic diet is similar to other strict low-carb diets, like the Atkins diet or LCHF (low carb, high fat). These diets often end up being ketogenic more or less by accident. The main difference between strict LCHF and keto is that protein is restricted in the latter. A rough guideline is 10% energy from carbohydrates, 15-25% protein, and 70% or more from fat.” (<https://www.dietdoctor.com/low-carb/keto>)

Fats

Amount	Food Source	Approximate Grams Fat
10 nuts	Almonds, Cashews, Hazelnuts , Macadamia nuts	15-20
5 nuts	Brazil nuts, Chestnuts, Walnuts* (2.7 g of Omega-3)	20
1 Tbsp, whole	Flaxseed* (2.4 g of Omega-3)	4.3
1 ounce	Chia seeds* (5 g of Omega-3)	9
	Salmon Fish Oil: (4.8 g of Omega-3 per tablespoon)	
3 ounces	Salmon (wild-caught): (1.7 g of Omega-3)	6
1 cup	Mackerel: (7 g of Omega-3)	34
	Cod Liver Oil: (2.7 g of Omega-3 per tablespoon)	
3 ounces	Tuna (1.4 g of Omega-3)	5
1 can - 3.75 oz.	Sardines: (1.4 g of Omega-3)	17
1	Egg Yolks	4.5
3.5 ounces	Lake Trout ((1.4 g of Omega-3)	4.5
1 Tbsp.	Butter	12
4.5 ounces	Beef Steak	24
1 whole	Avocado (75% of fat is unsaturated)	29

*** Good Source of ALA (plant-based Omega 3)**

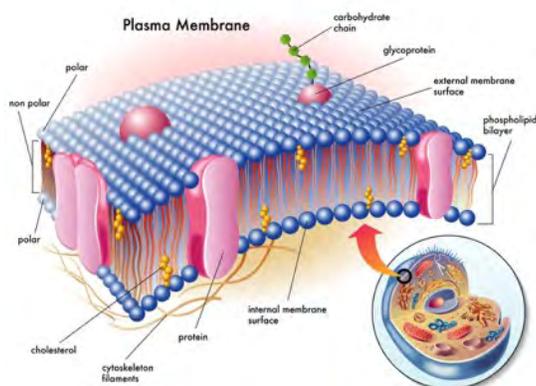
Source: USDA National Nutrient Database, 2017

Why do we need fats?

All living organisms are made up of one or more cells. The average adult human body has around 37 trillion cells (the estimate is different depending on how you calculate so some say 70 trillion). What do cells have to do with the importance of fats?

Cell membranes contain cholesterol, glycolipids, and phospholipids. In the body lipids are a group of molecules that include fats, waxes, sterols, glycerides, fat-soluble vitamins, phospholipids and many other molecules. Phospholipids are made from fatty acids like omega-6 and omega-3 polyunsaturated fatty acids (PUFAs). The lipids contained in the cell membranes determine the flexibility and permeability of the cell. Flexibility and permeability protect the interior of the cell by allowing certain substances into the cell while keeping other substances out.

Essential fatty acids (EFAs) have many important roles. During pregnancy and breastfeeding fatty acids are required for brain and eye development. They also regulate inflammation, blood clotting, and are needed for the absorption of fat-soluble vitamins from food.



DHA is found at very high concentrations in the cell membranes of the retina and nerve cells. The phospholipids of the brain's gray matter contain high proportions of DHA and AA and animal studies have shown that depletion of DHA in the brain can result in learning deficits.⁽⁶⁾ The levels of omega-3 fatty acids can affect every system in the body because every tissue in our body is made up of cells and every cell has a membrane.

Almost all of the energy needed by the human body is provided by the oxidation (large fats are broken down into triglycerides and fatty acids) of carbohydrates and fats. Carbohydrates provide an immediate source of energy while lipids provide an energy reserve. The body is able to store large amounts of lipids for energy reserve compared to the energy stored as glycogen (polysaccharide of glucose). Lipids yield 9 kcal of energy per gram while carbohydrates and proteins yield only 4 kcal of energy per gram.

In addition to energy, lipids insulate the body from heat loss, extreme temperature changes, and provide protective structural support to organs such as the heart, liver, kidneys, and spleen.

Dietary Fat

There are three fats commonly found in food: saturated fat, monounsaturated fat and polyunsaturated fat. An unsaturated fat has one or more double bonds in the fatty acid chain. A fat molecule is monounsaturated if it contains one double bond, and polyunsaturated if it contains more than one double bond. When double bonds are formed, hydrogen atoms are eliminated. Therefore, a saturated fat is "saturated" with hydrogen atoms.

Unsaturated fats are typically liquid at room temperature while saturated fats tend to be solid at room temperature. Scientists working in food manufacturing discovered that they could increase the shelf life and firmness of unsaturated fats through a chemical process called hydrogenation. However, adding hydrogen atoms to unsaturated fats results in *trans* fat, a molecule that is a health hazard. Artificial *trans* fats raise your bad (LDL) cholesterol levels and lower your good (HDL) cholesterol levels, increases your risk of developing heart disease and stroke, and is associated with a higher risk of developing type 2 diabetes.

Antioxidants can protect unsaturated fat from lipid peroxidation. In the body vitamin E protects polyunsaturated fatty acids and other components of cell membranes and low-density lipoprotein (LDL) from oxidation by free radicals. Saturated fats naturally resist oxidation, lipid peroxidation/rancidity.

What foods contain saturated fats?

Saturated fats occur naturally in many foods but the majority come from animal sources. Examples are:

- Fatty beef, lamb, pork, poultry with skin, beef fat (tallow), lard
- Butter, cheese, milk, cream, and other dairy products
- Palm oil, palm kernel oil coconut oil

What foods contain unsaturated fats?

Unsaturated fats occur mainly plants and fish. Examples are:

- Olives, nuts, seeds
- Fatty fish like salmon, mackerel, herring, tuna, and anchovy
- Avocados (about 75% is unsaturated)



Almost all foods contain both saturated and unsaturated fats. As an example, avocados contain saturated and unsaturated fats but the majority is unsaturated. Many foods also contain both monounsaturated and polyunsaturated fatty acids. Omega-6 and omega-3 fatty acids are polyunsaturated fatty acids (PUFAs).

Monounsaturated fatty acids (MUFAs) include omega-9 (oleic acid) and omega-7 (palmitoleic acid) fatty acids. Oleic acid a non essential fatty acid that is produced naturally by the body if there are adequate amounts of omega-3 and omega-6 fatty acids. Olive oil contains high amounts of oleic acid. High amounts of palmitoleic acid is found in macadamia nut/oil and sea buckthorn oil. Palm oil has a large amount of palmitic acid, a saturated fat.

MUFAs are typically liquid at room temperature but start to turn solid when chilled. Most of the studies of monounsaturated fats are based on olive oil which is a rich source of oleic acid. Other sources of high MUFAs include macadamia nuts, hazelnuts, almonds, pecans, avocados, and sunflower, canola, and safflower oils. Nut-based oils and avocado oil for cooking are available but not enjoyed by the majority of consumers.

Polyunsaturated Fats (PUFAs) are found mainly in vegetable oils, fish and seafood. They are liquid or soft at room temperature. Omega-3 and omega-6 fatty acids are types of PUFAs and are considered essential fatty acids because our bodies cannot make them, they must be obtained through the diet. PUFAs help stimulate skin and hair growth, maintain bone health, regulate metabolism, and maintain the reproductive system.

Cooking with PUFAs has disadvantages. The more unsaturated a fat is, the more unstable it is in the presence of heat and oxygen. This means that polyunsaturated fats are damaged more easily than monounsaturated fats. **High-oleic and saturated fats are best for cooking.** **Omega-6 fatty acids** are essential nutrients. Your body is unable to make them but uses them primarily for energy. The recommended ratio of omega-6 to omega-3 fatty acids in the diet is 4:1 or less. However, the Western diet has a ratio between 10:1 and 50:1.

Abstract: Simopoulos AP, The importance of the ratio of omega-6/omega-3 essential fatty acids. *Biomed Pharmacother.* 2002 Oct;56(8):365-79.

Several sources of information suggest that human beings evolved on a diet with a ratio of omega-6 to omega-3 essential fatty acids (EFA) of approximately 1 whereas in Western diets the ratio is 15/1-16.7/1. Western diets are deficient in omega-3 fatty acids, and have excessive amounts of omega-6 fatty acids compared with the diet on which human beings evolved and their genetic patterns were established.

Excessive amounts of omega-6 polyunsaturated fatty acids (PUFA) and a very high omega-6/omega-3 ratio, as is found in today's Western diets, promote the pathogenesis of many diseases, including cardiovascular disease, cancer, and inflammatory and autoimmune diseases, whereas increased levels of omega-3 PUFA (a low omega-6/omega-3 ratio) exert suppressive effects.

In the secondary prevention of cardiovascular disease, a ratio of 4/1 was associated with a 70% decrease in total mortality. A ratio of 2.5/1 reduced rectal cell proliferation in patients with colorectal cancer, whereas a ratio of 4/1 with the same amount of omega-3 PUFA had no effect. The lower omega-6/omega-3 ratio in women with breast cancer was associated with decreased risk. A ratio of 2-3/1 suppressed inflammation in patients with rheumatoid arthritis, and a ratio of 5/1 had a beneficial effect on patients with asthma, whereas a ratio of 10/1 had adverse consequences.

These studies indicate that the optimal ratio may vary with the disease under consideration. This is consistent with the fact that chronic diseases are multigenic and multifactorial. Therefore, it is quite possible that the therapeutic dose of omega-3 fatty acids will depend on the degree of severity of disease resulting from the genetic predisposition. A lower ratio of omega-6/omega-3 fatty acids is more desirable in reducing the risk of many of the chronic diseases of high prevalence in Western societies, as well as in the developing countries, that are being exported to the rest of the world.



The most common omega-6 fat is linoleic acid (LA). The body converts linoleic acid to Gamma-linolenic acid (GLA) and then to arachidonic acid (AA/ARA). Cell membranes store AA until it is needed as a precursor for the synthesis of eicosanoids. Eicosanoids are fast-acting, locally-produced hormones which include the prostaglandins, thromboxanes, and leukotrienes.

“The eicosanoids produce a wide range of biological effects on inflammatory responses (predominantly those of the joints, skin and eyes), on the intensity and duration of pain and fever, and on reproductive function (including the induction of labor). They also play important roles in inhibiting gastric acid secretion, regulating blood pressure through vasodilation or constriction, and inhibiting or activating platelet aggregation and thrombosis.”⁽¹⁴⁾

EPA (an omega-3) and AA (omega-6) are both used to produce eicosanoids but those produced by AA are more pro-inflammatory. While we often focus on the negative impact of inflammation, pro-inflammatory eicosanoids are vital in the first phase of healing. Inflammation is part of the body's natural response to infection and tissue damage. It is the chronic inflammation that may be damaging.

Dietary sources rich in preformed arachidonic acid include eggs and lean meats, such as poultry, organ meats and fish. Dietary sources of linoleic acid include vegetable oils such as sunflower, safflower, soybean, corn, as well as nuts and seeds. Walnuts also contain substantial amounts of alpha-linolenic acid, a plant-based omega-3 fatty acid.



Gamma-linolenic acid (GLA) is an omega-6 fatty acid found in certain oils, such as evening primrose oil and borage oil. According to the University of Maryland Medical Center, preliminary clinical research suggests that GLA, in the form of evening primrose oil, may be useful for the following conditions: diabetic neuropathy, rheumatoid arthritis, and allergies. They do suggest NOT taking omega-6 fatty acids if you have a seizure disorder.

“The fatty acid profile of borage is unique in that it contains 20 to 24 percent GLA. Evening primrose oil contains 8 to 10 percent GLA and black currant oil contains 15 to 17 percent.”⁽¹⁵⁾

Conjugated linoleic acid (CLA) is another form of omega-6 fat that may have some health benefits. “CLA is a natural, but minor, component of fats from ruminant animals that enters the human diet primarily in meat and dairy products. CLA has been shown to have many biological effects, including anticarcinogenesis, antiatherogenesis, immune modulation, and changes in body composition, and is commercially available as an over-the-counter supplement.” (Leah D Whigham, Abigail C Watras, and Dale A Schoeller, Efficacy of conjugated linoleic acid for reducing fat mass: a meta-analysis in humans, *Am J Clin Nutr* May 2007 vol. 85 no. 5 1203-1211)

Omega-3 fatty acids are the polyunsaturated fatty acids (PUFAs) that compete with omega-6 on the cellular level. Both are essential nutrients that we need in our diet but the ratio is important. As stated earlier, the recommended ratio of omega-6 to omega-3 fatty acids in the diet is 4:1 or less. Most sources recommend getting at least 1,000 milligrams a day of EPA/DHA and about 4,000 milligrams of total omega-3s (ALA/EPA/DHA combined).

*****1,000 milligrams = 1 gram so we need 4 grams of total omega 3**

Omega-3 fatty acids play important roles in the body as components of the phospholipids that form the structures of cell membranes, provide energy for the body, are required for growth and development, and are used to form eicosanoids. Research is expanding on DHA's role in neurodevelopment and the prevention of neuropsychiatric and neurodegenerative disorders.⁽¹⁶⁾ Inadequate intake of omega-3 fatty acids has been linked to an increased risk for the development of disease.

There are many types of omega-3 fats but the three most common are ALA, DHA, and EPA.

Alpha-linolenic acid (ALA): ALA is not incorporated into the phospholipids of cell membranes and is mainly used by the body for energy. This fatty acid can be converted in the body into EPA and then to DHA but the process is not very efficient. The request for DHA be considered at least “conditionally essential” is supported by several studies.⁽¹⁶⁾ The conversion of ALA to DHA occurs primarily in the liver with reported rates of less than 15%.

Some plant oils that contain ALA are flaxseed (linseed), soybean, and canola oils. Foods that contain some of the highest amounts of ALA include chia seeds, pumpkin seeds, tofu, spinach, green beans, Brussel sprouts, broccoli, and walnuts.



DHA should be regularly consumed as oily fish or consumed as fish oil or algal supplements. A diet incorporating pasture-fed livestock and poultry will provide meat and eggs with higher proportions of DHA but, oily fish provides the highest amount of DHA. **“With no other changes in diet, improvement of blood DHA status can be achieved with dietary supplements of preformed DHA, but not with supplementation of ALA, EPA, or other precursors.”** ⁽¹⁷⁾

Fish that contain the highest amount of omega-3 are cold-water fatty fish such as salmon, mackerel, tuna, herring, and sardines. Bass, tilapia, cod, and shellfish contain lower levels. “The omega-3 content of fish also depends on the composition of the food that the fish consumes. Farmed fish usually have higher levels of EPA and DHA than wild-caught fish, but it depends on the food they are fed. An analysis of the fatty acid composition of farm-raised Atlantic salmon from Scotland showed that the EPA and DHA content significantly decreased between 2006 and 2015 due to the replacement of traditional marine ingredients in fish feed with other ingredients.” (<https://ods.od.nih.gov/factsheets/Omega3FattyAcids-HealthProfessional>)

Algae-derived DHA is called algal oil. Algal oil serves as a vegetarian option. When using supplements an important question is whether they will provide the same benefit as the food. Is the DHA from algae bioequivalent to fish oil? According to the study published in the Journal of the American Dietetic Association the answer is yes, “These results indicate that algal-oil DHA capsules and cooked salmon appear to be bioequivalent in providing DHA to plasma and red blood cells and, accordingly, that algal-oil DHA capsules represent a safe and convenient source of non-fish-derived DHA.” ⁽¹⁹⁾

DHA concentration is especially high in the retina, brain, and sperm. DHA and EPA have potent anti-inflammatory effects. Chronic tissue inflammation can lead to the development of insulin resistance, type 2 diabetes, as well as cardiovascular and other chronic diseases.

“One issue that requires further investigation is the determination of the precise amount of dietary DHA required for optimum growth and development. Researchers often use the levels of DHA in breast milk as the yardstick. However, over the second half of the last century, much of the DHA has been processed out of the food supply. Most Western women are themselves at risk of DHA insufficiency. Stable isotope research has demonstrated that the 30% of breast

milk longer-chain polyunsaturated fatty acids is directly sourced from the maternal diet, where 70% comes from maternal stores, such as adipose tissue and endogenous synthesis. **When maternal stores are low and this is combined with a low-fat/high carbohydrate diet, increased endogenous fatty acid synthesis occurs in the mammary glands. Trans fatty acids, such as those found in many processed manufactured foods, are rapidly incorporated into breast milk and are associated with adverse effects in infants and children.**" (16)



The B vitamin folate, along with vitamins B6 and B12, have been shown in numerous studies to help lower homocysteine levels. High homocysteine levels lead to inflammation and have been linked to dementia, heart disease, stroke, and osteoporosis. "When omega-3 fatty acid concentrations are low, B vitamin treatment has no effect on cognitive decline in MCI (mild cognitive impairment), but when omega-3 levels are in the upper normal range, B vitamins interact to slow cognitive decline." (18)

The Benefits of Natural Omega-3 Foods

- Cardiovascular health (by lowering blood pressure, cholesterol, plaque buildup in the arteries, and the chance of having a heart attack or stroke)
- Stabilizing blood sugar levels
- Reducing muscle, bone and joint pain (lowers inflammation)
- Improves mood and prevents depression
- Improves concentration and learning
- Boosts immunity
- Eases digestive disorders like ulcerative colitis
- Reduces the risk of cancer
- Improves skin health
- May slow or prevent macular degeneration
- May reduce the risk of dementia and other cognitive decline disorders

Saturated Fats Vilified

The war on saturated fat is decades old and has infiltrated most scientific literature. Questionable scientific studies and corporate influence led to the recommendation of hydrogenated and partially-hydrogenated oils (*trans* fats) for heart health. The war on cholesterol is following the same path.

When medical authorities made a connection between saturated fats and heart disease in the 1980's the organizations Center for Science in the Public Interest and the National Heart Savers Association campaigned against the use saturated fats and endorsed trans fats as a healthy alternative. **In addition, many medical authorities also shared the view that trans fats were healthier than saturated fats.** - (<http://www.academia.edu>)

“In a review article published nearly 10 years ago in *The New England Journal of Medicine*, Dr. Willett and his colleagues estimated that removing trans fats from the U.S. food supply would prevent between 72,000 and 228,000 heart attacks each year.”⁽²⁰⁾ The FDA was made aware of the health hazards of trans fats by the Center for Science in the Public Interest in 1994. It took 12 years for the FDA to require that trans fats be listed on Nutrition Facts labels. In 2018 the FDA will no longer list hydrogenated and partially hydrogenated oils as “generally recognized as safe.” Companies have until 2018 to stop using partially hydrogenated oils or to petition the FDA for approval.⁽²⁰⁾ It took 23+ years for the FDA to correct an error that causes death and disease and they will still allow the companies to request approval for its use!

The good news: “Dietary saturated fatty acids are usually associated with negative consequences for human health. Experimental results on the relationship between doses, physiological effects, specificities and functions of individual saturated fatty acids are, however, conflicting. In this context, **this review describes emerging recent evidence that some saturated fatty acids have important and specific biological roles.** Such data are needed to allow a balanced view in terms of potential nutritional benefits of saturated fatty acids, and, if necessary, reassessment of the current nutritional dietary recommendations.”⁽²¹⁾

Saturated Fats

As with the unsaturated fats, there is no single saturated fat but rather a collection of different saturated fatty acids, each with specific biological functions. Common saturated fatty acids include butyric acid, lauric acid, myristic acid, palmitic acid, and stearic acid. In addition, saturated fatty acids exist as short, medium, and long-chain fatty acids.

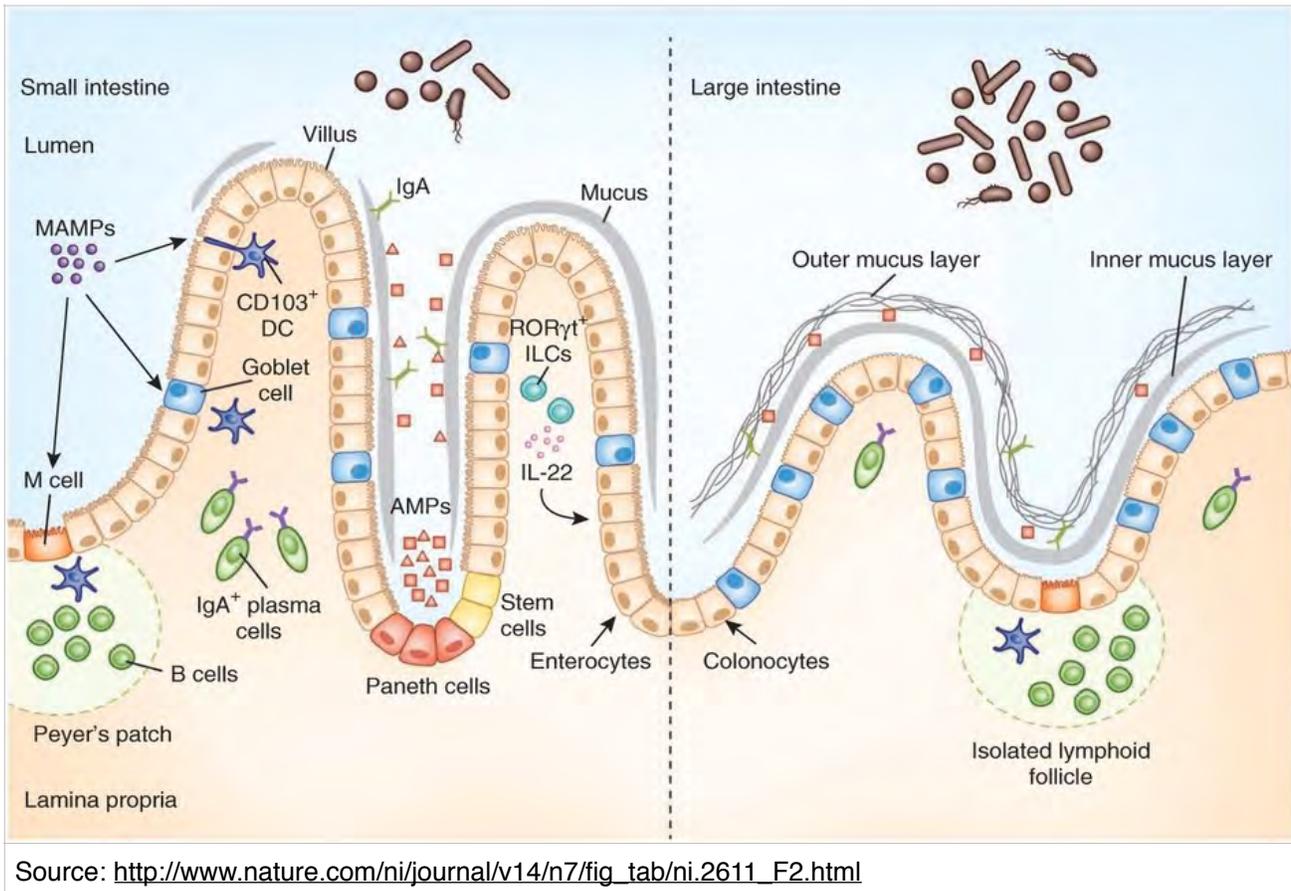
Long-chain fatty acids undergo chemical changes in the intestines and enter the systemic circulation through the lymphatic system. The short chain fatty acids, and most of the medium-chain fatty acids, enter the portal blood and are transported to the liver. Short-chain and medium-chain fatty acids supply energy more rapidly (like carbohydrates) than long-chain fatty acids.

Butyric acid is a short-chain fatty acid found in butter, ghee, raw milk, and animal fats. It is also formed in our colons. Gut microbiota produce butyrate by fermenting carbohydrates in a high fiber diet.

In the gastrointestinal tract butyric acid helps regulate “colonocyte proliferation and apoptosis, gastrointestinal tract motility and bacterial microflora composition in addition to its involvement in many other processes including immunoregulation and anti-inflammatory activity”.⁽²²⁾ Colonocytes are cells that line the interior surface of the large intestine. T

The digestive system has its own nervous system referred to as the enteric nervous system (ENS) and butyric acid is the main source of energy for enteric cells. The ENS contains millions of neurons and is commonly called your second brain. “Researchers are finding evidence that irritation in the gastrointestinal system may send signals to the central nervous system (CNS) that trigger mood changes.” (http://www.hopkinsmedicine.org/health/healthy_aging/healthy_body/the-brain-gut-connection)

The autonomic nervous system includes the enteric, sympathetic and parasympathetic nervous systems. The neurons of the enteric nervous system are found in the wall of the digestive system that extends from the esophagus to the anus. Enteric neuron cells secrete many neurotransmitters and most of them are identical to those found in the central nervous system (acetylcholine, dopamine, serotonin, etc.).



Lauric Acid, or dodecanoic acid, is a saturated medium-chain fatty acid. It is a major component of coconut oil and palm kernel oil. Lauric acid is transformed by the body into monolauric acid, a powerful monoglyceride. Lauric acid in breast milk is one of the substances responsible for helping infants fight and prevent infections from bacteria, fungi, and viruses.

“Coconut oil is rapidly metabolized because it is easily absorbed and lauric acid is easily transported. Detailed studies have shown that the majority of ingested lauric acid is transported directly to the liver where it is directly converted to energy and other metabolites rather than being stored as fat... Lauric acid and monolaurin have demonstrably significant antimicrobial activity against gram positive bacteria and a number of fungi and viruses. Today there are many commercial products that use lauric acid and monolaurin as antimicrobial agents.”⁽²³⁾

Coconut oil contains saturated, monounsaturated and polyunsaturated fats. It has 10 times more saturated than unsaturated fat, close to 12 g of saturated fat per tablespoon. The saturated fatty acids in coconut oil include **lauric acid (49%)**, palmitic, myristic, palmitic, caprylic, and stearic acid. The monounsaturated fat in coconut oil is made entirely of oleic acid which is the omega-9 unsaturated fatty acid found in olive oil. ⁽²⁴⁾

It has been reported that coconut oil is very effective against a variety of lipid-coated viruses. This included Cytomegalovirus (CMV), Epstein-Barr virus (EBV), influenza, virus, leukemia virus (a type of virus that infects T cells and can cause leukemia and lymphoma), pneumo viruses and the hepatitis C virus. The medium-chain fatty acids in coconut oil disrupt their membranes which interferes with virus assembly and maturation which essentially destroys them. ⁽²⁶⁾

Palm kernel oil contains **48.2% lauric acid**, myristic, palmitic, capric, caprylic, and stearic acid. It also contains about 15% oleic acid.



Palm oil is sometimes confused with palm kernel oil. Palm oil comes from the flesh of the fruit and the palm kernel oil from the kernel at the fruit's core. Palm oil from the palm fruit contains 50% saturated fatty acids, 40% monounsaturated fatty acids and 10% polyunsaturated fatty acids. The saturated fat component contains **44% palmitic acid**. Important nutrients in palm oil include carotenes, phytosterols, squalene, and vitamin E. ^(25, 26)

Palmitic acid and palm oil research is scanty and often contradictory. Red palm oil, according to Dr. Axe, "It is one of the few fatty fruits in existence, it's likely to hold a substantial place in the human diet and is the second most consumed vegetable oil in the world. It is different from other plant and animal oils in its fatty acid composition (50% saturated, 40% unsaturated, and 10% polyunsaturated) in that it does NOT promote atherosclerosis or arterial thrombosis. Where coconut oil has around 90% MCFA's (fat your body can easily burn for energy) palm oil only contains around 50% MCFA's." - <https://draxe.com/benefits-of-palm-oil>

Myristic acid has less research information than palmitic acid but I did find a conclusion in the European Journal of Clinical Nutrition that stated, "Intake of individual dietary SFA may affect fasting HDL cholesterol within 24 hours. Thus after this short period HDL cholesterol concentration was higher after myristic acid than stearic acid. Myristic acid resulted in a higher increase in postprandial HDL TAG than stearic acid."⁽²⁷⁾ SFA (saturated fatty acid)

Myristic acid, without the balance of the other fatty acids, appears to have some negative consequences. The use of whole food oil sources, and using a variety of oils (like all foods!), will keep the various fatty acids in balance.

Carbohydrates

Carbohydrates are the sugars, starches and fibers found in fruits, grains, legumes, vegetables and milk products. Carbohydrates are called simple or complex, depending on their chemical structure.

According to mayoclinic.org, 45 to 65 percent of your total daily calories should come from carbohydrates. Based on a diet of 2,000 calories per day 900-1,300 calories, or 225-325 grams, should come from carbohydrate sources. Carbohydrates should be in the form of fiber-rich vegetables, fruits, whole grains, and legumes. No one recommends added sugars!

Carbohydrates (saccharides/sugar) in foods and are classified as monosaccharides, disaccharides, polysaccharides, and oligosaccharides.

- Monosaccharides are often called simple sugars and include glucose, galactose, fructose.
- Disaccharides are two monosaccharides linked together and include lactose or "milk sugar" (glucose + galactose), sucrose or "table sugar" (glucose + fructose) and maltose (glucose + glucose).⁽²⁸⁾
- Polysaccharides include starch and undigestible fiber and are called complex carbohydrates.
- Most oligosaccharides are sugars that are indigestible and act as a soluble fiber.

"Legumes, or beans, are often called the "musical fruit" because they contain indigestible saccharides. Baked beans, chickpeas, lentils and soybeans have high amounts, and IBS patients should avoid them, or eat them in very small quantities" (<https://health.clevelandclinic.org/2014/02/take-control-of-ibs-with-low-fodmap-diet>)



Through the process of photosynthesis, plants make a sugar called glucose. The glucose is used in respiration, or converted into starch and stored. When we consume plant starch (amylose and amylopectin) it is broken down into absorbable sugars by the amylase enzyme located in the small intestine. Amylase is also released into saliva but most of the breakdown of starch occurs in the small intestine.

- High-starch vegetables include parsnips, pumpkin, zucchini, potatoes, yams, corn, peas, and winter squash.
- Low-starch vegetables include lettuce, asparagus, broccoli, cauliflower, cucumber, spinach, mushrooms, onions, peppers and tomatoes.
- High-starch fruits include plantains, bananas, and dried figs, raisins and apricots.
- High-starch crops include rice, wheat, oats, quinoa, bulgur, rye, barley, amaranth, millet, and sorghum. Grains and rices are naturally high in starch.

Oligosaccharides are short chains of sugars (typically 2-9 sugars in length) and fall between simple sugars and polysaccharides like starch. Humans lack the enzymes needed to digest most oligosaccharides but they are valuable in our large intestine. Oligosaccharides are prebiotics, soluble fiber, and when fermented by intestinal bacteria, a source of short-chain fatty acids (SCFA) and absorbable nutrients. Butyrate, an energy source for colonocytes, is one of the SCFAs produced during fermentation. SCFAs also promote the growth of lactobacilli and bifidobacteria.

A prebiotic is a non-digestible food component that promotes the growth of beneficial bacteria in the intestines. Fructo-oligosaccharides (FOS), galacto-oligosaccharides (GOS), and inulin are prebiotics being added to many food and supplement products. Human breast milk contains also contains oligosaccharides and is known simply as “human milk oligosaccharide”. The beneficial *Bifidobacterium* species usually dominates the feces of breast fed babies and it is likely due to their ability to use the oligosaccharides in breast milk. ⁽²⁹⁾

“Members of the genus *Bifidobacterium* are some of the most common organisms in the human intestinal tract. It has been suggested that *Bifidobacterium* species are important in maintaining general health because they contribute to a beneficial microflora in the intestinal tract and that the diversity and number of *Bifidobacterium* species provide a marker for the stability of the human intestinal microflora.”⁽³⁰⁾

Oligosaccharide food examples

- Vegetables: artichoke, asparagus, beetroot, broccoli, Brussel sprouts, cabbage, fennel, garlic, leek, okra, onion, pea, shallot, eggplant, celery, pumpkin, and many more.
- Legumes: baked bean, chickpea, lentil, red kidney bean
- Fruits: custard apple, persimmon, rambutan, watermelon, white peach
- Raw chicory root and acacia gum/gum arabic



“A developing body of evidence supports a role for prebiotics in reducing the risk and severity of GI infection and inflammation, including diarrhea, inflammatory bowel disease, and ulcerative colitis as well as bowel function disorders, including irritable bowel syndrome. Prebiotics also increase the bioavailability and uptake of minerals and data suggest that they reduce the risk of obesity by promoting satiety and weight loss. Additional research is needed to define the relationship between the consumption of different prebiotics and improvement of human health.”⁽³¹⁾

Fiber

Dietary fiber, in general, refers to the edible parts of food plants that are primarily undigestible (pectin, bran, cellulose, resistant starch, etc.) or not absorbed in the small intestine. Because fiber is undigestible it passes from the small intestine to the large intestine. In addition to fiber, vegetables, fruits, nuts, and seeds, are also an abundant source of vitamins, minerals, and phytochemicals (phenolics, carotenoids, beta-glucan, etc.).⁽³²⁾ Legumes, rices, and grains also contain fiber and nutrients.

Soluble and insoluble fiber are usually found together in whole foods. The amount of each type of fiber varies from plant to plant so a variety of food choices is needed. The health benefits of dietary fiber (all the nutrients contained in the plant) is supported by several studies and is allowed specific claims for health under FDA laws.

“Recent studies support this inverse relationship between dietary fiber and the development of several types of cancers including colorectal, small intestine, oral, larynx and breast. Although most studies agree with these findings, the mechanisms responsible are still unclear. Several modes of actions however have been proposed. First, dietary fiber (DF) resists digestion in the small intestine, thereby allowing it to enter the large intestine where it is fermented to produce short chain fatty acids, which have anti-carcinogenic properties. Second, since DF increases fecal bulking and viscosity, there is less contact time between potential carcinogens and mucosal cells. Third, DF increases the binding between bile acids and carcinogens. Fourth, increased intake of dietary fiber yield increased levels of antioxidants. Fifth, DF may increase the amount of estrogen excreted in the feces due to an inhibition of estrogen absorption in the intestines.”⁽³²⁾

Soluble fiber

- Dissolves in water, in the body it becomes a gel-like substance
- Includes pectin, gum, and mucilage
- Is fermented in the large intestine by the actions of beneficial bacteria
- Softens stool (absorbs water) and creates bulk to speed up the passage of food
- Prevents constipation and diarrhea
- Binds to fatty acids and sugar which prevents or slows their absorption into the blood



Examples of herbs with high mucilage content include marshmallow, mullein, slippery elm, plantain, psyllium, fenugreek, and comfrey. Preparing these herbs for immediate consumption as a tea or as a topical treatment (skin wash, drawing or soothing poultice, sitz bath) is easily done with water (soluble in water, dissolves in water).

Insoluble fiber (roughage)

- Does not dissolve water, mainly retains its shape in the body
- Includes hemicellulose, cellulose
- Found primarily in the stalks, skins, and seeds
- Helps prevent constipation
- Moves toxic waste through the colon in less time

Fruit Sugars



In botany, a fruit is the seed-bearing structure in flowering plants formed from the ovary after flowering. Fruits contain both fructose and glucose. Sucrose is a blend of glucose and fructose and is present in ripe fruits. Because fruits are high in fiber and fructose, they do not cause drastic changes in blood sugar levels (fructose is metabolized almost completely in the liver). This makes many fruits a low-glycemic-index food. Fruits, especially colorful ones, contain antioxidants, essential minerals and vitamins, and dietary fiber.

Fruit is a great food! Fruit is a “bad” food! There are times when a person may need to be reduced or stop eating fruit. If fruit needs to be removed while correcting high triglycerides, excessive weight, insulin resistance, type 2 diabetes, or pre-diabetes it may be added back in slowly. Fruit doesn’t cause the disease in the body but it may need to be temporarily eliminated if the person has consumed large amounts of high-fructose corn syrup or was living on a standard American diet (SAD).

In the book, *There Is a Cure for Diabetes*, Dr. Gabriel Cousens writes:

“One of the unique things about fructose metabolism, according to Elizabeth Parks in the *Journal of Nutrition* (2000), is the surprising speed with which humans make fat from fructose. Once the body is trained in the fructose metabolic pathways, it is difficult to turn it off. The body makes a decision when glucose enters the system whether to store it as fat or to burn it. Fructose does not get involved in this decision and bypasses burning, going directly to storage. More and more research is showing that high-fructose corn syrup converts more quickly to triglycerides and adipose tissues than blood glucose. Fructose also interferes with leptin and insulin signaling.”

The Journal of Nutrition article, Dietary Fructose and Glucose Differentially Affect Lipid and Glucose Homeostasis, states: “Investigators began recommending the use of fructose instead of glucose, because acutely, it did not raise blood glucose or insulin levels, in contrast to glucose. However, the price for this potential benefit is rapid uptake by the liver and often conversion into TG (triglyceride). Diets high in fructose are a common way to induce features of metabolic syndrome in rodent models. There is sufficient data from controlled dietary studies conducted for at least 4 wk to conclude that diets containing $\geq 20\%$ energy as fructose are more likely to cause lipid abnormalities (hypertriglyceridemia due to VLDL increases in those with hyperinsulinemia and LDL-C increases in normoinsulinemic subjects) compared with diets containing $\geq 20\%$ energy as either glucose or starch. Moreover, quite a substantial body of literature indicates that dietary fructose plays a role in causing nonalcoholic liver steatosis.”⁽³³⁾

Yes, fruit has sugar. It also has a wide range of antioxidant vitamins and several minerals that are needed for a healthy body. They also have fiber which slows the absorption of sugars. Unless a person is on a very restrictive diet for a specific reason, fruit is a healthy energy and nutrient boost between meals.

Legumes

A legume is a plant, or its fruit or seed in the family Fabaceae (or Leguminosae). Worldwide, the Fabaceae family consists of over 20,000 species of trees, shrubs, vines, and herbs. There are three subfamilies with the Fabaceae family: Papilionoideae, Caesalpinioideae and Mimosoideae.



The Papilionoideae contain most of the crop species we consume. It includes soy beans, soy nuts, carob nuts, adzuki beans, black beans, anasazi beans, fava beans, garbanzo beans(chickpeas), kidney beans and lima beans, common green peas, snow peas, snap peas, split peas and black-eyed peas, lentils, and peanuts. There are several antinutrients, plant compounds that reduce or inhibit the absorption of nutrients in the Papilionoideae family.

Some common herbs from the Fabaceae family include alfalfa, Glycyrrhiza (licorice), clover, fenugreek, and even senna (subfamily of Caesalpinioideae). The majority of the Caesalpinioideae and Mimosoideae are tropical or subtropical trees and shrubs.⁽³⁴⁾

Common Antinutrients

Phytate (phytic acid) reduces the absorption of minerals like calcium, iron, and zinc. It is mainly found in seeds, nuts, grains and legumes. Soaking, sprouting, fermenting, and cooking will reduce the amount of phytic acid in foods. Beans require 16 hours of soaking before cooking to improve the nutritive value.⁽³⁵⁾

Nuts and seeds are often eaten raw but soaking them will make them easier to digest (they contain enzyme inhibitors) and reduce the phytic acid content. Most people eat them raw which, in small amounts, is an easy and fast way to balance sugars, curb the appetite, and provide energy. Yes, soaking nuts and seeds is best. Yes, raw nuts and seeds are a healthy alternative to carb-based snacks.

Raw or inadequately cooked beans are poisonous and may cause extreme nausea, vomiting, diarrhea, and severe inflammation in the intestines. Bean flours require cooking and grinding or extrusion (food processing blades) with enough heat to inactive enzyme inhibitors and lectins. (Elkowicz and Sosulski, [1982](#); Alonso et al., [2000](#)). Sparvoli F, Laureati M, Pilu R, et al. Exploitation of Common Bean Flours with Low Antinutrient Content for Making Nutritionally Enhanced Biscuits. *Frontiers in Plant Science*. 2016;7:928. doi:10.3389/fpls.2016.00928.)

Lectins are carbohydrate binding (glyco) proteins found in all food plants but are abundant in raw legumes and grains. Lectins are not digested, they bind to the cells lining our digestive tract and may cause several reactions. Damage to the intestinal wall is one such reaction. "Systemically, they can disrupt lipid, carbohydrate and protein metabolism, promote enlargement and/or atrophy of key internal organs and tissues and alter the hormonal and immunological status. At high intakes, lectins can seriously threaten the growth and health of consuming animals."⁽³⁶⁾

There are several types of lectins and some have a role in promoting health in the body. Like phytic acid, lectins can be reduced by soaking, fermenting, or sprouting the high lectin legumes and grains. **“Lectins are resistant to dry heat, so using raw legume flours in baked goods should be done with caution.”**⁽³⁷⁾

Undigested lectins result in an immune response that creates antibodies and almost everyone has antibodies for lectins. Antibodies are also called immunoglobulins which remember the substance that activated them for a future immune response. The result is food intolerances or food allergies.⁽³⁷⁾

Worldwide, wheat is one of the most consumed grains. In the U.S. and Europe whole grain consumption is encouraged by “government-supported dietary guidelines” and consumption is supported by government. There is evidence that the wheat and other cereal grains that contain gluten and lectin, cause chronic inflammation and autoimmune diseases by increasing intestinal permeability (leaky guts). Undigested proteins and peptides initiate a “pro-inflammatory immune response.”⁽³⁸⁾

Gluten family

Wheat gluten is a family of proteins that include gliadins, glutenins, albumins and globulins. They have a high proline and glutamine content with a structure that makes them partly resistant to proteases (protein digestive enzymes) like trypsin. This leads to undigested peptides that are able to activate the intestinal immune system.



While gluten is well studied in the role of celiac disease, the wheat amylase trypsin inhibitors (ATIs) are finally getting attention. ATIs have been found to be significant stimulators of innate immune cells (dendritic cells, macrophages, monocytes).⁽³⁹⁾ Innate immunity is a nonspecific defense mechanism that is activated immediately or within hours of detecting an antigen’s (toxin or other foreign substance) appearance in the body.

Dr. William Davis, a cardiologist and the author of *Wheat Belly*, has much to say about gliadin and none of it is positive. Some of his findings include:

- Gliadin has the ability to increase intestinal permeability which allows foreign substances into the bloodstream. The result is autoimmune disease.
- Antibodies to gliadin are able to bind to nervous system tissue which may lead to immune-mediate neurological impairment.
- Antibodies against gluten, gliadin and casein are increased in autistic children.
- When digested, gliadin is broken down in exorphins. Exorphins are able to cross the blood-brain barrier and cause behavioral issues that include “outbursts and inattention in children with ADHD and autism, hearing voices and social detachment in schizophrenics, and the mania of bipolar illness”.

“Gluten intolerance is an autoimmune enteropathy caused by heterogeneous mixture of wheat storage proteins. Malabsorption symptoms imply diarrhoea, abdominal pain/bloating and weight loss. This case describes a 22-year-old female subject, who had chronic headache, joint pain, urticaria and long period of amenorrhea. Skin prick tests revealed a sensitisation to α -gliadin, while neurological, gynaecological, endocrine and clinical-laboratory examinations did not justify the above-mentioned symptoms. **Gluten-free diet resolved chronic symptoms and re-established the menstrual cycle, whereas a temporary gliadin daily diet re-exacerbated all clinical symptoms.** Urticaria occurred [within] 20 minutes and the chronic headache the next day after exposure to the gliadin-rich diet. In addition, the missing of the expected menstrual bleeding was observed. **This case demonstrates that gliadin intake can induce malabsorption and ‘idiopathic’ neuronal or gynaecological symptoms.’**

(Mingomataj EÇ, Gjata E, Bakiri A, Xhixha F, Hyso E, Ibrani A. Gliadin allergy manifested with chronic urticaria, headache and amenorrhea. *BMJ Case Reports*. 2011;2011:bcr1020114907. doi:10.1136/bcr.10.2011.4907.)

Amylase is an enzyme that breaks down starch and glycogen into simple sugars. Trypsin is one of the three main enzymes that breakdown proteins. Toll-like receptors (TLRs) are proteins that play a prominent role in the innate immune system. Wheat amylase-trypsin inhibitors (ATIs) activate the toll-like receptors, the innate immune system. Gluten-containing cereals have high concentrations of ATIs and ATIs increase low-level intestinal inflammation.⁽⁴⁰⁾

Wheat amylase-trypsin inhibitors are not destroyed in processed or baked foods. The difference between older wheat varieties (such as Emmer or Einkorn) and the modern hexaploid wheat is that the modern wheat was found to be highly resistant to proteases (protein digesting enzymes). Modern wheat also has high levels of toll-like receptor activation (immune reaction).⁽⁴⁰⁾

Interesting abstract (glyphosate and our intestinal environment)

“The use of glyphosate modifies the environment which stresses the living microorganisms. The aim of the present study was to determine the real impact of glyphosate on potential pathogens and beneficial members of poultry microbiota in vitro. The presented results evidence that the highly pathogenic bacteria as *Salmonella enteritidis*, *Salmonella gallinarum*, *Salmonella typhimurium*, *Clostridium perfringens* and *Clostridium botulinum* are highly resistant to glyphosate. However, most of beneficial bacteria as *Enterococcus faecalis*, *Enterococcus faecium*, *Bacillus badius*, *Bifidobacterium adolescentis* and *Lactobacillus* spp. were found to be moderate to highly susceptible. Also *Campylobacter* spp. were found to be susceptible to glyphosate. A reduction of beneficial bacteria in the gastrointestinal tract microbiota by ingestion of glyphosate could disturb the normal gut bacterial community. Also, the toxicity of glyphosate to the most prevalent *Enterococcus* spp. could be a significant predisposing factor that is associated with the increase in *C. botulinum*-mediated diseases by suppressing the antagonistic effect of these bacteria on *Clostridia*.”

(Shehata AA, Schrödl W, Aldin AA, Hafez HM, Krüger M. The effect of glyphosate on potential pathogens and beneficial members of poultry microbiota in vitro. *Curr Microbiol*. 2013 Apr;66(4):350-8.)

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