Vitamins at a Glance

Introduction

Vitamins are necessary for growth, health, vitality, and resistance to disease. Without vitamins (and minerals), enzymes cannot repair the body. Vitamin deficiencies lead to a host of disorders.

Thirteen vitamins are necessary for life. Some, like biotin, pantothenic acid, and vitamin K, can be produced within the body. Others have to be brought in via food and supplements. Some of their duties include helping to digest food, fight infection, and manufacture new cells.

There are two kinds of vitamins.

- **Fat-soluble** vitamins (A,D,E,K) are stored in the liver and cannot be absorbed properly unless adequate fats and minerals are present. Unlike other vitamins which are measured in milligrams, fat-soluble vitamins are generally measured in International Units (IU).
- **Water-soluble** vitamins (B & C) are not stored in the body and easily washed out, especially when the body is under stress. Thus, they need to be replenished daily, if not more often.

Deficiencies often occur for various reasons: fasting, dieting, use of alcohol, caffeine, cigarettes, sugar, processed food, soft drinks, stress (mental and physical) and so on.

Medications deplete nutrients, especially the easy-to-destroy water-soluble vitamins. For example, HRTs are prescribed to women to reduce the risk of heart disease. A dangerous irony, however, is that the nutrients they deplete increase homocysteine levels which significantly raises the risk of heart disease.

B vitamins work as a team, each helping the other to perform. This family is so inter-related that taking only one can create a deficiency in one or more of the others. Most are unable to fully complete their functions if other members of the family are not present.

There are about fourteen recognized vitamins in the B-complex family - most with numbers but some without. The actual number varies according to differing views. Even though they are not true B vitamins, Choline and PABA (para-aminobenzoic acid) are often included because they have B-like qualities.

The following are the B vitamins according to their designated number.

- B1 - Thiamin
- B2 - Riboflavin
- B3 - Niacin
- B5 - Pantothenic Acid
- B6 - Pyridoxine
- B7 - Biotin
- B8 - Inositol
- B9 - Folic Acid (Folate)
- B12 - Cobalamine
- B13 - Orotic Acid
- B15 - Pangamic Acid
- B17 - Laetrile

Natural versus Synthetic Vitamins

It is thought that there is no chemical difference between natural vitamins derived from plants or animals and those produced in a laboratory. However, the body appears to know the difference since
it cannot utilize synthetics nearly as well as the natural.

In addition, synthetic vitamins actually deplete the body of nutrients, put extra strain on the liver and kidneys, and are stored as toxins.

Students of fundamental biochemistry are well aware that nutrients do not exist as single entities able to perform on their own. Instead, those in natural foods consist of various compounds that act synergistically with each other.

Therefore, the preferred choice is to obtain nutrients from whole, fresh, raw, organically-grown foods; although that is becoming increasingly difficult. Even a good diet requires some supplementation because nutrients are lost as food is transported from long distances and stored for long periods of time.

**Remember** - processed food, alcohol, caffeinated beverages, sulfates/nitrates, and drugs destroy many nutrients, enzymes, and good bacteria, replacing them with empty calories, toxins, and other substances that negatively affect health.

**Tips:**
Always take vitamins with food to enhance absorption. Timing can be up to 10 minutes before a meal or 30 minutes after.

It is not advisable to take a vitamin by itself since they work more efficiently together.

Take only natural vitamin supplements. synthetics are generally cheaper but not so in the long-run because the body can only utilize 20%-40% as opposed to nearly 100% of the natural.

Select reputable products from those trained in nutrition and supplements.

Store according to package labels.

Check expiry dates before purchase.

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**Water Soluble Vitamins at a Glance**

B-complex, Choline, PABA, C, P, L

**Vitamin B1**

*(Thiamin)*

**Dosage:** 25 to 100 mg per day in divided doses

**Concentrated amounts in humans** are found in skeletal muscles as well as the brain, heart, liver, kidneys, and nervous system tissues.

**NOTE:** Thiamin requirements **increase** during fever, muscular activity, overactive thyroid, pregnancy and lactation, post-surgery, mental and physical stress, use of oral contraceptives, dialysis, heavy consumption of caffeinated drinks, tea, and in such disorders as schizophrenia

**Active coenzyme:** thiamin pyrophosphate

**Helpers:** other B vitamins, C, E, manganese, sulfur

**Inhibitors:** cooking, heat, water, ultraviolet light, sulfites, nitrates, live yeasts, betel nuts, fevers, hyperthyroidism, liver and digestion deterioration, baking soda, vitamins B6 & B12
Deficiencies, enzyme thiaminase (present in raw fish), excess sugar consumption, sweating

**Drugs that deplete:** alcohol, acid blockers, amphetamines, antacids, anti-arrhythmics, antibiotics, anti-convulsants, anti-depressants, anti-inflammatories, barbiturates, bronchodilators, diuretics (all), estrogens, HRTs, tobacco

**Food sources:** fortified breads, cereals, pasta, rice bran, whole grains (especially wheat germ & brown rice), lean meats (especially pork), organ meats (especially liver), dried beans, peas, peanuts, soybeans, asparagus, spinach, sunflower seeds, celery, green and split peas, tomatoes, eggplant, mustard greens, brussels sprouts, cabbage, watermelon, carrots, squash, broccoli, corn, kale, pineapple, oats, oranges, lentils

**Actions:**
- metabolizes carbohydrates for energy production
- required by every cell to make ATP (energy)
- converts fatty acids to steroid hormones
- necessary for healthy skin, growth, fertility, and lactation
- strengthens the immune system
- enhances circulation
- vital for a healthy nervous system
- required for synthesis of acetylcholine (the primary neurotransmitter)
- stabilizes appetite
- digestive aid
- mental function
- prevents motion sickness
- important for normal heart and muscle function
- improves mood

**Deficiency symptoms:**
- classic deficiency diseases are beriberi, Korsakoff’s, & Wernicke’s
- neuromuscular, intestinal, & cardiovascular deterioration
- poor carbohydrate metabolism
- brain deterioration
- impaired memory
- depression
- irritability
- emotional agitation & deterioration
- decreased vision
- memory loss
- unexplained weight loss
- loss of appetite
- optic nerve inflammation
- CNS deterioration
- reflex loss in legs
- increased pyruvic acid in the blood
- feet or legs tingle or burn
- decreased sense of touch
- fatigue
- decreased appetite & digestion
- constipation
- decreased immunity
- decreased protein synthesis
• abdominal & chest pains
• cardiac deterioration
• decreased blood pressure
• varicose veins
• bluish skin color
• labored breathing
• muscle weakness progressing to atrophy
• decreased cancer resistance
• loss of ankle & knee reflexes
• lack of concentration

**Vitamin B2**
(Riboflavin)

**Dosage:** 15 to 50 mg per day in divided doses with food

**Notes:**
- The name comes from Ribose (a sugar that is part of its structure and the basis for Riboflavin’s energy production) and Flavin (indicating its yellow colour)
- It is its strong color that is responsible for turning urine a bright yellow
- Alcoholics, the elderly, the poor, depressed individuals, and those who participate in hard exercise are at a much higher risk of deficiency and therefore, often require more. Be sure to take a B-complex in addition.

**Active coenzymes:**
- FAD (flavin adenine dinucleotide)
- FMN (flavin mononucleotide)

**Helpers:** vitamins B3, B6, C, phosphorus, fiber

**Inhibitors:** light, alkali, water, fats, cooking, storage of food in clear glass bottles, sodium bicarbonate

**Drugs that deplete:** acid blockers, alcohol, anti-biotics, anti-depressants, anti-histamines, anti-inflammatoryatories, anti-nausea, anti-psychotics, barbiturates, estrogens, HRTs

**Food sources:** lean meats, beef liver, eggs, oysters, salmon, tuna, legumes, nuts, asparagus, broccoli, crimini mushrooms, whole grains, dark green leafy vegetables, avocados, currants, asparagus, broccoli, Brussels sprouts, green beans, cabbage, strawberries, raspberries, summer squash, tempeh, plums

**Actions:**
- necessary for cell respiration
- helps convert all nutrients into active forms
- helps produce energy
- assists with thyroid hormone metabolism
- vital for eye health
- helps prevent cataracts
- helps eyes adapt to light
- helps eliminate dandruff
- necessary for red blood cell production
• helps form antibodies
• necessary for the absorption of iron and B6
• necessary for healthy skin, hair, nails

**Deficiency symptoms:**

• retarded growth
• cracks and sores around the mouth
• scaley facial skin
• frequent itching, burning, or a grainy feeling under the eyelids
• bloodshot eyes
• light sensitivity
• eye fatigue
• dilated pupils
• sties or cataracts
• needing a higher volume of light to see
• burning hands or feet
• vaginal itching
• genital rashes
• eczema of the face and genitalia
• inability to urinate
• anemia
• decreased appetite & weight
• deterioration of digestion
• fatigue
• depression
• increased emotional agitation
• dizziness
• trembling
• decreased antibody production
• delayed wound healing
• thinning hair
• oily skin
• skin inflammations
• baldness
• sore and purplish tongue (glossitis)
• deterioration of protein utilization

**Vitamin B3**
(Niacin / Niacinamide)

**Dosage:** up to 100 mg – more can cause flushing unless no-flush forms are used

**Active coenzymes:**

• NAD (nicotinamide adenine dinucleotide)
• NADP (adenine dinucleotide phosphate)
• Both are involved in more than 200 energy metabolism reactions of carbohydrates, fats, and amino acids
Forms:
- IM (immediate release)
- SR (sustained or time-released – which can be toxic to the liver)
- IHN (contains inositol)

Notes:
- In the body, some of the Niacin is converted to Niacinamide (a synonym for Nicotinamide) which is then further converted to a compound called NAD (Nicotinamide Adenine Dinucleotide).
- Niacin helps control cholesterol. It can be synthesized by intestinal bacteria. Tryptophan is a precursor for niacin.
- Niacinamide is used to treat or prevent diabetes and arthritis
- Longterm use can increase the need for the other B vitamins so it is best to take with a B complex

Helpers: B complex, vitamin C, phosphorus

Inhibitors: water, cooking water, processed food, sodium nitrate, leucine (amino acid in high concentrations in millet), excess sugar consumption

Drugs that deplete: alcohol, aminoglycosides, anti-biotics, anti-depressants, anti-gout, anti-inflammatories, diuretics, estrogens, HRTs, laxatives, sleeping pills

Food sources: dairy products, poultry, fish, lean meats, nuts, peanuts, eggs, some fortified foods, whole wheat, brewer's yeast, legumes, corn, broccoli, tomatoes, carrots, crimini mushrooms

Actions:
- necessary for healthy skin and gastro-intestinal tract
- important for nervous system activity
- helps reduce cholesterol & triglyceride levels
- prevents pellagra
- improves circulation by dilating blood vessels (flushing)
- helps manufacture sex and adrenal hormones
- necessary for the proper function of all body tissues
- needed to produce hydrochloric acid which is necessary for digestion
- important for the normal secretion of bile & stomach fluid
- helps regulate blood sugar levels
- helps other B vitamins in energy production
- helps reduce heart disease
- decreases vertigo

Deficiency symptoms:
- failing vision
- hypersensitivity to light
- skin bronzing, indicating early stages of pellagra
- skin inflammations and acne
- hypersensitivities including rashes, cracked or scaly skin
- bad breath
- tender gums
- mouth sores
• diarrhea
• digestive upsets
• ulcers
• nausea
• decreased appetite
• decreased sense of taste but a hyperacute sense of smell
• fatigue
• nervousness, irritability
• emotional instability
• depression
• mood swings
• apathy
• confusion
• hallucinations
• headaches
• backaches
• memory loss
• insomnia
• muscle weakness
• deterioration of amino acid utilization
• increased serum cholesterol

**Vitamin B5**
(Pantothenic Acid)

**Dosage:** up to 500 mg per day along with a B-complex

**Concentrated amounts in humans** are found in all living cells, blood plasma, and lymph fluid. The adrenal glands are important sites of B5 activity.

**Forms:**
- calcium D-pantothenate is a synthetic; often used in supplements
- dexpanthenol (aka pantothenol) is a synthetic; often used in topical ointments

**Helpers:** intestinal bacteria, vitamins A and C, other B vitamins, sulfur

**Inhibitors:** cooking, food processing and refining, iron, methyl bromide (fumigant used in foods), acids such as vinegar, alkalis such as baking soda

**Drugs that deplete:** alcohol, anti-biotics, anti-depressants, aspirin and other NSAIDs, barbiturates, caffeine, estrogens, HRTs, sedatives

**Food sources:** organ meats, fish, lobsters, poultry, soybeans, lentils, split peas, yogurt, eggs, avocado, cashews, peanuts, royal jelly, crimini mushrooms, cauliflower, broccoli, sweet potatoes, brewer's yeast, tomatoes – almost all foods but destroyed during processing and cooking.

**Actions:**
- needed to form coenzyme A which metabolizes carbs, fats, & proteins
- works closely with other B vitamins
• builds immune defenses
• increases ability to handle stress
• vital for adrenal gland function and known as the anti-stress vitamin
• needed for energy production
• important for healthy skin
• necessary for proper nerve transmission
• helpful in preventing and treating rheumatoid arthritis, paralytic ileus, allergic skin reactions, and stress
• helps slow aging
• helps reduce toxic effects of antibiotics and radiation

**Deficiency symptoms:**

- depression
- personality changes
- cardiac instability
- frequent infections
- fatigue
- abdominal pains
- sleep disturbances
- neurological disorders including numbness and burning hands or feet
- muscle weakness
- leg cramps
- low blood pressure and blood sugar
- weakness
- emotional deterioration
- reduced metabolic processes
- dizziness
- increased heart beat (tachycardia)
- kidney hemorrhages
- decreased antibody production
- decreased balance, coordination, and reflexes
- constipation
- nausea
- deterioration of appetite & digestion
- reduced production of HCL & Pepsin leading to constipation
- duodenal ulcers
- decreased adrenal function
- insulin sensitivity
- convulsions
- spinal cord and corneal (eye) deterioration
- fetal abnormalities
- testicle deterioration
- retarded growth
- headaches
- skin deterioration
- slow healing
- decreased radiation protection

**Vitamin B6**

*(Pyridoxine)*
Dosage: up to 300 mg daily along with a B-complex

Forms:

- B6 is composed of three related compounds, all of which are found in food: pyridoxine, pyridoxal, & pyridoxamine
- **pyridoxine hydrochloride** – used in vitamin supplements because it is cheaper to produce
- **pyridoxal-5'-phosphate** – the main active form which is responsible for more than 100 enzyme actions involved in metabolism of fats, carbs, & proteins
- **pyridoxamine** is no longer sold in the US as a dietary supplement. In January 2009, the FDA ruled that it must be regulated as a pharmaceutical because its active ingredient is used in the drug Pyridorin, used to halt the progression of diabetic neuropathy

Notes:

- B6 is stable in acids but less so in alkalis
- A rebound deficiency can occur if large doses are halted abruptly
- Can be toxic if taken at high doses. Recovery takes place after stopping or severely minimizing dosage

Helpers: other B vitamins, C, essential fatty acids, magnesium, potassium, sodium, beneficial intestinal bacteria

Inhibitors: long storage, cooking (up to 70% is lost), water, food processing, alkaline environments, ultraviolet light, air pollutants, stress, yellow dye #5, PCBs, rancid fats, chemicals used to ripen fruits, eating meat frequently

Drugs that deplete: ACE inhibitors, alcohol, anti-biotics, anti-depressants, anti-hypertensives, anti-Parkinson’s, anti-tuberculars, bronchodilators, chemotherapy, diuretics, estrogens, HRTs, immunosuppressants, oral contraceptives, sedatives, steroids, tartrazines (yellow dyes used in food & drugs), tobacco

Food sources: beans, nuts, sunflower seeds, bananas, broccoli, spinach, carrots, peas legumes, eggs, meats, fish, whole grains, fortified breads and cereals, blackstrap molasses, brewer’s yeast, walnuts, avocados, organ meats

Actions:

- necessary for over 60 enzyme reactions involving the metabolism of amino acids and essential fatty acids
- useful for treating asthma, autism, heart disease, depression, epilepsy, diabetes, PMS, migraines and carpal tunnel syndrome
- inhibits the formation of oxalate kidney stones
- natural diuretic
- helps absorb B12
- vital for proper immune system function
- essential for 5-HTP (an enzyme needed to convert tryptophan to serotonin or niacin)
- helps synthesis of melatonin from serotonin
- critical for normal brain function
- helps prevent homocysteine accumulation
- helps produce HCL (hydrochloric acid)
- facilitates glycogen conversion to glucose
- vital for antibody and red blood cell production
• necessary for proper synthesis & activity of DNA and RNA
• required to produce such neurotransmitters as serotonin, GABA, norepinephrine, acetylcholine, histamine
• essential for producing progesterone (a hormone that balances excessive estrogen)

**Deficiency symptoms:**
- convulsions
- abnormal brain waves
- confusion
- mental deterioration and retardation
- nervousness
- insomnia
- deterioration of dream recall
- nervous system deterioration
- pain sensitivity
- muscle pain, cramping, or numbness
- temporary limb paralysis
- tendon or ligament difficulties
- menopausal arthritis
- unexplained swellings
- water retention
- increased urination, xanthurenic acid, and vitamin C in urine
- nausea or motion sickness
- anemia
- decreased blood sugar & glucose tolerance
- fatigue
- deterioration of protein synthesis and supply to the brain
- cracks, scaling around the mouth and eyes
- glossy tongue, inflamed gums and mouth sores
- decreased immunity
- greasy or cheesy skin oozing
- oily or sparse hair
- skin inflammations
- dandruff
- visual deterioration
- decreased hemoglobin production
- heart disease
- increased cholesterol
- atherosclerosis
- decreased levels of coenzyme pyridoxal phosphate
- decreased lymph cell count
- kidney stones
- scaly, dry skin

**Vitamin B7**
(Biotin)

**Dosage:** 3 mg daily but take with a B-complex

**Notes:**
- Also known as vitamin H
• Although officially designated a B vitamin, in some circles, it is still not considered a true vitamin since it is absorbed and biosynthesized by friendly bacteria in the small intestine.

**Helpers:** adequate amounts of friendly intestinal bacteria

**Inhibitors:** raw egg whites

**Drugs that deplete:** alcohol, amphetamines, analgesics, antibiotics, anti-convulsants, barbiturates, estrogens, HRTs, nicotine, oral contraceptives

**Food sources:** brewers' yeast, royal jelly, oatmeal, molasses, wheat germ, peas, cauliflower, unpolished rice, almonds, carrots, tomato, chard, onions, whole grain breads, avocado, artichoke, raspberries, cooked eggs, peanuts, mackerel, herring, bananas, currants, organ meats, oysters, crab, beef, turkey, chicken, lamb

**Actions:**
- metabolizes carbs, proteins, and fats into energy
- necessary for the formation of glycogen
- necessary to synthesize several non-essential amino acids
- helps with the formation of nucleic acids (RNA, DNA) and fatty acids
- necessary for cell growth and replication
- necessary for healthy, skin, hair, and nails
- helps treat cradle cap (seborrheic dermatitis)
- helps children with cowlicks that produce unruly or uncombable hair
- helps with dry, splitting fingernails

**Deficiency symptoms:**
- muscle pain and cramps; in children, often called *growing pains*
- eczema or dermatitis in infants, children, or adults
- deterioration of physical and mental development
- keratoconjunctivitis (inflammation of the cornea and conjunctiva of the eye)
- deterioration of T & B cell production
- increased susceptibility to bacterial and fungal infections
- brittle, split, or peeling fingernails
- progressive thinning of hair, eyebrows, eyelashes
- loss of hair color
- intense depression
- lethargy (loss of energy)
- hallucinations
- lack of feeling or tingling in the extremities
- in infants, decreased strength, lethargy, and development
- scaly, red rash around the eyes, nose, mouth, and genitals
- unusual facial fat distribution known as *biotin deficient face*
- sore tongue
- dry, flaky skin
- heart irregularities
- insomnia
- loss of appetite
- increased cholesterol levels
- sensitive to touch
**Vitamin B8**  
*(Inositol)*

**Dosage:** 100 to 1000 mg daily (no known toxicity levels)

**Concentrated amounts in humans** are found in brain, heart, muscles, liver, pancreas, and kidneys. Concentrations are second highest of the B-vitamins, following Niacin (B3)

**Notes:**
- Inositol is closely associated with choline but in lesser amounts
- Not considered essential since the body can produce it from glucose
- Diabetics and those with MS (multiple sclerosis) should take extra as inositol deficiency is common in these groups

**Forms:**
- phytic acid (in plants)
- myoinositol (in humans)

**Helpers:** B complex, essential fatty acids, choline, friendly intestinal bacteria

**Inhibitors:** water, estrogen, food processing

**Drugs that deplete:** antibiotics (all), antidepressants, caffeine, HRTs, oral contraceptives

**Food sources** include lecithin (phosphatidyl complex), beans, brown rice, oats, nuts, bananas, raisins, peanuts, cabbage, blackstrap molasses, brewer’s yeast, citrus fruits (except lemons), cantaloupe, meat, unrefined grains, raisins, beef heart and liver, wheat germ

**Actions:**
- necessary for cell membrane structure and integrity
- necessary for the growth of all cells, especially bone marrow, eye tissue, intestines
- helps redistribute fat and decreases fatty liver deposits
- feeds brain cells
- aids in hair growth and prevents thinning and baldness
- helpful in treating eczema, anxiety, depression, and mental disorders
- helps treat polycystic ovary syndrome
- protects against cardiovascular disorders
- has mild anti-anxiety effects
- helps improve nerve function in diabetics

**Deficiency symptoms:**
- impaired brain function, depression, panic attacks, obsessive-compulsive disorders
- thinning hair
- eczema
- increased cholesterol
- insomnia
- contributes to development of diabetes mellitus, MS, and atherosclerosis
- constipation
- diabetic neuropathy

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**Vitamin B9**  
*(Folic Acid, Folate, Folacin)*

www.innvista.com   Nutrients at a Glance   Pam Duff, RN CSNC
**Dosage:** up to 1500 mcg (1.5 mg) daily

**Forms:**
- Folate (naturally-occurring form found in food)
- Folic acid (synthetic form of folate found in supplements and fortified foods)
- Folacin (a derivative of folic acid consisting of a pteridine molecule, PABA, and glutamic acid - in other words, a vitamin within a vitamin)

**Note:** excessive intake can mask a B12 deficiency

**Helpers:** B-complex, zinc, vitamin C, friendly intestinal bacteria

**Inhibitors:** water, heat, light, oxygen, food processing, cooking, storage

**Drugs that deplete:** alcohol, acid blockers (all), analgesics (all types), antacids, antibiotics (all), anti-cancers, anticonvulsants, antidepressants, anti-inflammatories, anti-gout, barbiturates, benzodiazepines, cholesterol-lowering, diabetic meds, diuretics, estrogens, HRTs, muscle relaxants, oral contraceptives, sedatives, steroids

**Food sources** include brewer's yeast, eggs, beans, legumes, citrus fruits and juices, wheat germ & bran, whole grains, dark green, leafy vegetables, poultry, pork, shellfish, liver

**Actions:**
- prevents such disorders as neural tube defects, celiac disease, cervical dysplasia, osteoporosis, atherosclerosis, candidiasis, anxiety, depression, macrocytic anemia
- assists B12 in red blood cell formation
- assists B6 and B12 in preventing homocysteine formation (high levels are linked to an increased risk of diabetes, Alzheimers, rheumatoid arthritis, and cardiovascular diseases)
- cell division & replication
- protein metabolism
- increases appetite by stimulating hydrochloric acid production
- enhances liver functions
- synthesizes some amino acids
- metabolism of RNA and DNA

**Deficiency symptoms:**
- macrocytic or megaloblastic anemia (lack of mature red blood cells, or red blood cells that are larger than normal and contain less hemoglobin levels than normal)
- disrupts DNA metabolism, especially in red blood cells, leukocytes, and cells of the stomach, intestine, vagina, and cervix
- elevated homocysteine levels
- spina bifida
- fatigue and weakness
- numbness or tingling in hands & feet
- slow or weak pulse
- decreased white blood cells
- decreased immunity
- thinning and graying hair
- skin pallor
- depression
- diarrhea
• headaches
• anorexia and nausea
• infections
• sore, inflamed, or smooth tongue
• digestive disturbances
• retarded growth
• irritability
• apathy
• hostility
• insomnia
• toxemia during pregnancy
• premature placental separation & births
• increased rates of breast and colorectal cancers

**Vitamin B12**
(Cobalamin)

**Dosage:** up to 5000 mcg per day

**Forms:**
- Cyanocobalamin (synthetic used in many drugs and supplements even though absorption is poor)
- Methylcobalamin (the only form the body can use)
- Adenosylcobalamin (a co-factor of cyanocobalamin)
- Hydroxocobalamin (commonly used in injectibles)
- Hydroxycyanocobalamin / Hydroxy B12 (easily converts to coenzyme forms and readily binds body stores of cyanide, unlike cyanocobalamin)

**Notes:**
- B12 is a generic name for a specific group of cobalt-containing corrinoids. The best known one is cobalamin. It is the only known metabolite to contain cobalt, which gives it its red colour.
- Older adults and those with digestive problems should take a sublingual B12 supplement because it bypasses the digestive system
- A rebound deficiency can occur if large doses are halted abruptly
- A deficiency leads to folic acid deficiency and low levels of melatonin
- A poorly functioning thyroid contributes to B12 deficiency
- A lack of intrinsic factor results in malabsorption of cobalamin which leads to life-threatening anaemia and irreversible neurological damage
- Blood measurement of vitamin B12 is routinely used to determine deficiency, but may not be a reliable indication since tissue levels may appear to be normal but serum levels may register low.

**Helpers:** intrinsic factor, hydrochloric acid, other B vitamins, C, potassium, sodium, calcium

**Inhibitors:** acid, alkali, water, heat, B6 deficiency, sunlight, junk food, refined sugars

**Drugs that deplete:** acid blockers, ACE inhibitors, alcohol, analgesics, antibiotics, anti-cancers, anti-convulsants, anti-depressants, anti-gout, anti-Parkinson’s, anti-retrovirals, anti-
virals, barbiturates, cholesterol-lowering, diabetic meds, estrogens, HIV drugs, HRTs, oral contraceptives, potassium chloride supplements and drugs, psychiatric meds

**Food sources:** (B12 from food sources is only released when there are adequate amounts of hydrochloric acid in the stomach) – eggs, organ meats, meat, poultry, shellfish, milk products, vegetarian or Red Star brewer’s yeast

**Actions:**
- assists folic acid in the formation of red blood cells and the body to use iron
- helps support the immune system
- essential for the formation and longevity of all cells, especially bone marrow, nervous tissue, and the gastrointestinal tract
- critical for circulation
- vital for adrenal gland hormone production
- helps synthesis many nutrients, including choline and methionine
- helps metabolize folic acid
- assists metabolism of proteins, fats, and carbohydrates
- vital for the formation of nucleic acids (RNA, DNA)
- prevents pernicious anemia
- helps maintain the nervous system especially the myelin sheath
- assists memory, mental clarity, and concentration
- helps maintain fertility
- helps prevent depression
- necessary for growth and energy
- used to treat multiple sclerosis, diabetes, and asthma
- helps create more melatonin, which regulates sleep patterns

**Deficiency symptoms:**
- pernicious anemia accompanied by degeneration of the spinal cord
- yellow-blue color blindness and decreased color perception
- large or abnormal blood cells (pernicious anemia)
- decreased blood clotting
- menstrual deterioration
- heart palpitations
- decreased growth and carbohydrate metabolism
- occasional digestive problems
- muscle weakness or stiffness
- weak pulse
- numbness or tingling in extremities
- shooting pains or needles and pins sensations
- fatigue, paleness
- depression or stuporous depression often displaying a hangover effect
- emotional agitation and deterioration
- decreased memory and concentration
- deterioration of the nervous system and brain function
- hallucinations or manic behavior
- senility
- difficulty walking and decreased reflexes
- nervousness
- sore, red tongue
- difficulty swallowing
- diarrhea
- body odor
• dandruff
• premature gray hair
• deterioration of folic acid utilization
• blood iron levels deceptively increased
• sterility
• decreased immunity
• dreaming in color
• serious apathy

**Vitamin B13**  
(*Orotic acid*)

**Dosage:** not yet established

**Notes:**
- Not yet recognized as a true vitamin but may be an accessory nutrient. Sometimes found as orotate salts combined with such minerals as calcium, magnesium, or potassium
- Also known as *whey factor* and *animal galactose factor*
- The body can make orotic acid from its amino acid pool

**Helpers:** intestinal flora, B-complex, calcium, magnesium, potassium, zinc

**Inhibitors:** water, sunlight

**Food sources:** root vegetables (such as carrots, beets, Jerusalem artichokes), whey

**Actions:**
- helps transport such minerals as calcium, magnesium, and potassium into the blood
- helps *fix* magnesium, making it more usable especially for maintaining proper heart rhythm, protecting the heart from excessive stress responses, and allowing blood vessels to dilate
- helps prevent certain liver problems and premature aging
- useful in treating multiple sclerosis
- a precursor for nucleic acids (RNA, DNA) and necessary for their metabolism
- essential growth factor for micro-organisms
- helps restore certain cells
- necessary to metabolize folic acid and B12
- a critical intermediate in the urea cycle

**Deficiency symptoms:**
- anemia
- large or abnormal red blood cells
- heart disease including arrhythmias
- deterioration of skin quality
- eczema and/or psoriasis
- increased weight gain
- crystals in the urine
- cell and growth deterioration
- mental deterioration and retardation
- liver deterioration
- premature aging
• decreased usage of vitamin B12
• decreased immunity

**Vitamin B15**  
*(Pangamic acid)*

**Dosage:** up to 200 mg daily in divided doses

**Forms:**
• DMG – dimethylglycine
• TMG – trimethylglycine

**Note:**
• The FDA has pulled this from the market. Therefore, consumers may substitute DMG which is thought to increase B15 production in the body. Researchers believe that DMG is the active component of B15
• Since it is a methyl donor, it helps in the form certain amino acids such as methionine

**Helpers:** vitamins A, B, C, E

**Inhibitors:** water, direct sunlight, cooking

**Food sources:** brewer’s yeast, brown rice, pumpkin seeds, sesame seeds, sunflower seeds, nuts, oatflakes, wheat germ and bran, barley

**Actions:**
• increases oxygen supply to tissues to prevent hypoxia
• has antioxidant properties
• helps with protein metabolism
• stimulates nervous and glandular tissues
• boosts immune responses
• prolongs cell life
• helps prevent fatty liver by enhancing liver function
• helps lower cholesterol levels
• helps neutralize liquor cravings
• important for normal growth and brain activity
• helps produce stress hormones and in adrenal gland function
• important for normal hair pigment and growth
• helps prevent fatigue, asthma, rheumatism
• useful in treating substance addictions, autism, mental illnesses, minimal forms of brain damage, senility, aging, Alzheimer’s, heart and liver diseases, diabetes, organ poisoning, acute athletic injuries
• has anti-cancer properties
• powerful detoxifier of poisons, urban pollutants, and free radicals

**Deficiency symptoms:**
• headaches
• heart palpitations and deterioration
• chest pain (angina) and shortness of breath
• asthma and emphysema
• stress
• insomnia
• premature aging
• decreased blood oxygenation
• increased blood cholesterol
• atherosclerosis
• deterioration of circulatory systems, glandular function, nervous system, mental health
• insufficient oxygen to cells (hypoxia) which shortens cell life
• slow wound healing
• decreased immunity
• fatigue
• decreased protein synthesis
• glaucoma

**Vitamin B17**
*(Amygdalin / Laetrile)*

**Dosage:** 100 to 500 mg (equals up to 20 apricot kernels per day or 1 to 2 cups of mung bean sprouts)

**Notes:**
• B17 is not digested in the stomach. Rather, enzymes in the small intestine break it down into various compounds which are then absorbed.
• B17 from fruit kernels help cancer cells because they also contain cyanide. Cancer cells do not possess the normal enzyme called *rhodanese* but they do have the enzyme *beta-glucosidase* which releases the cyanide from food sources which, ultimately, ends up poisoning themselves.
• It is the only B vitamin NOT present in brewer's yeast.

**Helpers:** pancreatic enzymes, vitamins A, C, E, B15

**Food sources** include the kernels of almonds, apricots, peaches, plums, cherries, nectarines, apples, chokecherries, sprouted seeds (especially mung beans), vetches, clovers, sorghums, cassava, lima beans, acacia fruits

**Actions:**
• cancer cell antagonist
• stimulates glands and nervous system
• protects the liver from fatty deposits
• powerful detoxifier
• increases life span of normal cells

**Deficiency symptoms:**
• hypoxia (insufficient supply of oxygen in living tissue)
• premature aging
• asthma
• emphysema
• fatigue
• glaucoma
• heart palpitations
• possible angina pains
Choline

**Dosage:** 500 to 3500 mg per day in divided doses

**Concentrated amounts in humans** are found as an integral part of the neurotransmitter acetylcholine and in the fat layers of every cell membrane in the body

**Notes:**
- It is the newest member of the B family, receiving status in 1998 but not given a corresponding number as with other B vitamins.
- Can increase phosphorus levels. Since phosphorus and calcium should be kept in balance, taking large amounts of lecithin (of which choline is a major component) might increase calcium needs
- Those most at risk for a deficiency are alcoholics, endurance athletes, and vegans who do not supplement with lecithin

**Forms:** phosphatidyl choline (also known as lecithin)

**Helpers:** other B vitamins

**Inhibitors:** cooking, storage, processing, excess sugar intake

**Drugs that Deplete:** alcohol, anti-biotics, anti-cancers, anti-convulsants, anti-depressants, anti-histamines

**Food sources:** soybean lecithin, egg yolk, liver and other organ meats, brewer’s yeast, nuts, brussels sprouts, broccoli, wheat germ, soybeans, peanuts, potatoes, cauliflower, lentils, oats, sesame and flax seeds

**Actions:**
- a precursor of betaine hydrochloric acid, which is vital for digestion and the SAMe synthesis pathway
- modifies cell membrane fats giving them greater flexibility for longevity
- precursor to, and a component of, the neurotransmitter, acetylcholine
- necessary for proper fat and cholesterol metabolism
- vital for the growth and development fetuses and children
- necessary for the proper transmission of nerve impulses
- protects the myelin sheaths that surround nerves
- vital for muscle function
- important for brain function and memory
- exports fat from the liver
- important for healthy gall bladder, kidneys, and liver
- relieves twitchiness thus helping to improve learning
- controls cholesterol levels
- assists liver in toxin removal
- assists in the synthesis of such hormones as epinephrine
- helps treat and prevent angina, atherosclerosis, thrombosis, stroke

**Deficiency symptoms:**
- decreased brain function
• decreased fat transport for energy
• fatty liver
• increased blood pressure
• atherosclerosis
• tardive dyskinesia
• Huntington’s disease
• Alzheimer’s
• manic depression
• elevated cholesterol levels
• coronary heart disease or stroke
• fatigue
• insomnia
• decreased kidney function
• causes a deficiency of folic acid
• abnormalities in bone and red blood cell formation
• infertility
• respiratory distress and failure to thrive in newborns
• anemia
• high blood pressure
• nerve degeneration
• increased infections
• significant increase in cancer activity

**PABA**
*(para-aminobenzoic acid)*

**Dosage:** 25 to 200 mg daily

**Notes:**
- Also known as *vitamin Bx, bacterial vitamin H, and the grey hair factor*
- PABA is part of the folic acid molecule
- Although classified as a B-type vitamin, it is considered more of a B co-factor
- Warnings have been issued about PABA in suntan lotions but researchers have not found that PABA causes skin cancer. Instead, it has been linked to allergic reactions, likely from other chemicals in the products or combined with them. One such chemical is oxybenzone. PABA works in the same way as oxybenzone by absorbing UV rays. In 1989, an FDA report stated that a PABA ester component decomposed to a known carcinogen, despite any real proof that PABA in sunscreen was associated with cancer *(Orlando Sentinel, March 11, 1989, Cancer Experts Fear Report Will Cause Sunscreen Scare)*. Regardless, the reputations of PABA and PABA esters were damaged.
- PABA sunscreens are prohibited from many coral-reef tourist destinations.

**Helpers:** B-complex, C, HCl (hydrochloric acid)

**Inhibitors:** water, processing, PABA-containing compounds such as Novocain

**Drugs that Deplete:** alcohol, anti-biotics, especially sulpha drugs which compete with PABA in the digestive tract thus preventing normal metabolism of folic acid by bacteria and the function of the medication
Food sources include liver, kidney, brewer's yeast, molasses, whole grains, mushrooms, spinach, eggs

Actions:

• supports folic acid production
• stimulates intestinal bacteria
• acts as a coenzyme in breaking down proteins
• assists in red blood cell formation
• helps prevent eczema & vitiligo (loss of skin pigmentation)
• helps control pain of burns
• helps protect the skin against UVB radiation but not UVA
• increases effectiveness of B5 (Pantothenic acid)
• antioxidant capacity
• important to hair pigmentation

Deficiency symptoms:

• gastrointestinal disorders
• irritability
• depression
• fatigue
• lupus
• loss of sex drive
• constipation
• eczema including weeping eczema
• premature greying of hair
• nausea with liver irritation
• anorexia
• vitiligo (skin depigmentation)

Vitamin C

Dosage: 500 to 5000 mg per day in divided doses

Concentrated amounts in humans are found in the lens of the eye, liver, and the adrenal glands, which explains why stress rapidly depletes the body of vitamin C.

Forms:

• Ascorbic acid (glucose derivative)
• Ascorbates (derived from minerals making them buffered and less acidic)
• Ester C: a trade mark form of calcium ascorbate; also contains some vitamin C metabolites: dehydroascorbate (oxidized ascorbic acid), calcium threonate, and trace levels of xylonate and lyxonate
• Ascorbyl palmitate: a fat-soluble vitamin C ester; should not be confused with Ester-C

Notes:

• A rebound deficiency can occur if large doses are halted abruptly.
• Chewable vitamin C can erode tooth enamel unless teeth are brushed immediately after.
• Humans are the only animal that cannot make their own vitamin C from glucose
• Although studies indicate vitamin C and B6 help the frequency and severity of airway constriction and lessens the frequency of asthma episodes, it does not seem to help those already on steroid medication
• Vitamin C is easily destroyed by high temperatures which explains an increased need during fevers
• Vitamin C may reverse anticoagulant activity of warfarin
• Diabetics and heart patients may require less medication if taking vitamin C
• Vitamin C may alter lab test results taken to establish blood glucose levels and can give a false negative in tests for blood in the stool. There are test kits available that are not affected by vitamin C. Always notify your health care professional if taking any supplements, as they can not only falsify diagnostic tests, but can also interfere with the actions of many medications, as well as masking other nutrient deficiencies.

Helpers: bioflavonoids, vitamins E, B2, calcium, magnesium, selenium, beta carotene

Inhibitors: ginseng, smoking, water, cooking, heat, light, oxygen, alkali, carbon monoxide, stress (physical & emotional), iron (ferrous sulfate), copper

Drugs that deplete: alcohol, antacids, acid blockers, adrenalin, analgesics, anti-arrhythmics, anti-biotics, anti-depressants, anti-inflammatories including NSAIDs, aspirin & substitutes (can triple the rate of depletion as well as increasing digestive bleeding risks), anti-spasmodics, atropine, barbiturates, bronchodilators, corticosteroids, diuretics, estrogen-containing, muscle relaxants, nicotine, nitrates

Food sources: (most is lost during transportation and storage) - parsley, broccoli, bell peppers, strawberries, oranges, lemon juice, papaya, cauliflower, kale, mustard greens, Brussels sprouts, kiwi fruit, rose hips, acerola cherries, black currants, camu camu berries, bell peppers, fresh parsley

Actions:
• potent antioxidant protecting many nutrients from oxidative damage
• enhances immune system and protects against infections
• promotes hemoglobin formation
• a co-factor for enzyme reactions
• important for making collagen and elastin, serotonin, norepinephrine, thyroxine, and some corticosteroids
• vital for wound repair, healthy gums, and preventing bruising
• necessary for the growth and repair of all tissue cells
• accelerates the healing of burns
• reduces chemical toxicities
• necessary for proper adrenal gland function, including secreting anti-stress hormones
• assists in the manufacture of brain and nerve substances
• has antihistamine and diuretic effects
• lowers risk of cardiovascular diseases, cancers, and such bacterial infections as whooping cough
• decreases cholesterol by controlling the conversion of cholesterol to bile acids
• helps prevent cataracts
• regenerates vitamin E supplies
• strengthens blood vessels
• activates folic acid (vitamin B9)
• involved in the reduction, storage, and absorption of iron
• helps metabolize such amino acids as phenylalanine, tyrosine, & tryptophan
• helps detoxify such heavy metals as mercury, lead, cadmium, & nickel
• neutralizes chloramines (chemicals added to purify drinking water instead of chlorine – both of which are carcinogens)
• the primary constituent of bone, cartilage, and connective tissue
• a natural laxative - if doses are high enough

**Deficiency symptoms:**
• scurvy
• dry, splitting hair
• excessive hair loss
• inflamed or bleeding gums
• bloodshot eyes
• rough, dry, scaly skin
• impaired digestion & decreased appetite
• slow wound healing
• easy bruising
• frequent nosebleeds
• loose teeth and weakened tooth enamel
• swollen & painful joints
• anemia
• frequent, longer-lasting infections
• decreased immunity and cancer resistance
• slowed metabolism
• increased cholesterol levels
• separation of long bone ends
• aching muscles or extremities
• drying of the tear glands
• weakness and fatigue
• depression or emotional agitation
• ecchymoses and petechiae on the buttocks and lower extremities
• shortness of breath
• gallstones
• intolerance to heat & cold
• chronic back trouble
• weak teeth and bones in children
• swelling or hardening of hair follicles (hyperkeratosis)
• shortness of breath
• gallstones
• decreased heat or cold tolerance
• back trouble

**History**
When sailors showed symptoms of scurvy, scientists tried to find the cause. In 1593, Sir Richard Hawkins noted that the condition lessened considerably when sailors ate citrus fruits, but it was not until the mid 1700s that Hawkins’ antidote was revived.

In 1804, the British Navy finally made it mandatory that each sailor be allotted limes on their voyages. Hence, the name *limies* was given to them. Finally, in 1932, a Hungarian scientist isolated and identified vitamin C as the nutrient responsible for the age-old disease of scurvy. He called it *ascorbic acid*, which literally means *no scurvy*.

In Canada, during the winter of 1535, Jacques Cartier recorded that many of his men were dying of scurvy, but were cured almost overnight when the Indians showed him how to make a brew from the growing tips of pine or spruce trees.
**How much is enough?**
The RDA value of 60 mg per day for adults was chosen to provide enough vitamin C to prevent scurvy and to allow for adequate reserves. This figure was based on the concept that urinary excretion of vitamin C indicates that body stores are near saturation. Recent research is outdated this concept, since numerous other factors are involved which can cause an excretion of vitamin C.

We also now know that much more than 60 mg is required to maintain health within today's environmental and dietary conditions. A minimum of 200 mg is usually mandatory just to maintain tissue values, with more being required in response to such stressors as poor diet, infection, smoking, environmental pollutants, use of drugs and medications, surgery, burns, alcohol, or any other trauma to the body including emotional.

**Vitamin C and Kidney Stones**
Many health practitioners recommend that those suffering from kidney stones or gout stop taking vitamin C, since it was thought to raise the acid level in the urine, resulting in the conclusion that it must contribute to kidney stones. However, the opposite was found to be true. By raising the acid levels in the urine, vitamin C actually assists in dissolving stones.

**Vitamin C and Cholesterol**
Vitamin C helps lower cholesterol levels by controlling the conversion of cholesterol to bile acids, preventing free radicals from oxidizing cholesterol in the blood stream and from damaging lipids. It enhances the ability of prostaglandins to keep blood cells from sticking together to form plaque and helps the arteries to dilate. With vitamin C, all this is done more effectively, efficiently, cheaply, and safely than designer drugs.

**Signs of Scurvy**
The four H's determine a diagnosis of scurvy:
- **hemorrhage** (tiny "blood" spots on the skin - ecchymoses and petechiae)
- **hyperkeratosis** (tiny raised hard bumps on the skin)
- **hypochondriasis** (overwhelming fear about one's health)
- **hematologic abnormalities** (abnormal blood levels)

**Vitamin P**
(Bioflavonoids)

- **Bioflavonoids** is a term used to describe biologically active flavonoids. Both words are often used interchangeably.
- Bioflavonoids are best known for increasing the effects of vitamin C and are now considered to be a separate class of nutrient.
- There are more than 2000 known bioflavonoids and more than 5000 known flavonoids. Both belong to a large category called Phytochemicals.
- Phytochemicals consist of more than 2000 naturally occurring compounds found in plants. They are responsible for color and effects on the senses (taste, smell, sight and touch). Some of the better known phytochemicals include flavonoids (bioflavonoids), carotenoids, phytoestrogens (isoflavones, lignans) and phytosterols (sterols and sterolins).

**Dosage:** 500 to 2000 mg daily or 250 mg for every 500 mg vitamin C

**Helpers:** vitamin C
Inhibitors: heat, water, processing

Drugs that Deplete: none known

Food sources: the white matter in citrus peel, peppers, grapes, pine bark, onions, garlic, berries, green tea, buckwheat

Actions:
• enhances function & absorption of vitamin C
• prevents vitamin C and adrenaline from being oxidized by copper-containing enzymes
• powerful antioxidants, anti-inflammatories, and anti-virals
• helps prevent various cancers, cataracts, high blood pressure, diabetic retinopathy, peripheral hemorrhage, edema, and bruising
• helps reduce menopausal symptoms
• natural antihistamine (quercetin)
• helps prevent bleeding gums and varicose veins while strengthening capillary walls (rutin)

Deficiency symptoms:
• fragile blood vessels
• easy bruising
• frequent nose bleeds
• blood cell aggregation
• increased risk of blood clots
• decreased vitamin C availability
• decreased vitamin A absorption
• decreased epinephrine levels
• increase in varicose veins & hemorrhoids
• increased viral infections
• decreased frostbite resistance

### Vitamin L

Based on *Staying Healthy with Nutrition* by Elson Haas and Buck Levin (pp.146, 147, 793), 2006

The LOVE vitamin was coined by humanologist, Bethany Argisle. Vitamin L is one of the most vital nutrients for optimal wellness and necessary for every cell, tissue, and organ in the body.

**Dosage:** Requirements vary with the individual. Generally, the higher the dose, the better – unlike other nutrients. Experts advise that a minimum of 4 hugs a day is needed to prevent a deficiency, 6 hugs for maintenance, and 10 hugs for growth.

**Concentrated amounts can be found** in the heart and minds of most moms, dads, & grandparents as well as in numerous other individuals.

**Notes:**
• No toxic effects – ever.
• This vitamin is addictive and sudden withdrawal can have devastating side effects that range from uncontrolled weeping to serious health and mental issues.
• Good side effects from this vitamin range from swooning, to a strange feeling in the chest, goose bumps, staring into space, happy tears, or bursting into song.

**Helpers:** genuine compliments, assistance in times of need, hand-made gifts, thoughtful
notes, a listening/non-judgmental ear, home-cooked meals, and others too numerous to list here.

**Inhibitors:** fear, anger, worry, self-absorption, revenge, gossip, depression, sadness, pain, stress, greed, and other negative emotions.

**Some sources include:** caring individuals that include some brothers, sisters, husbands, wives, friends, strangers, plus social gatherings of family & friends, dogs, cats, horses, flowers, trees, birds, massage therapy and so on.

**Actions:**
- regenerates cells and body tissues
- revitalizes energy & positive outlook
- catalyzes all human functions
- vital to heart function
- anti-aging and anti-stress
- enhances nervous system function & brain endorphins
- speeds physical, emotional, & spiritual healing
- important for all human relations (domestic & international)

**Deficiency symptoms:**
- fatigue
- irritability
- increased stress
- digestive upsets
- drug and/or alcohol dependency
- various health and sexual problems
- muscle tension
- feelings of hopelessness

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**Fat-Soluble Vitamins at a Glance**

**A, D, E, F, K**

**Vitamin A**

**Daily Dosage:** Retinol (2,500-20,000 IU); Beta-carotene (5,000-200,000 IU)

**Concentrated amounts in humans** are found in the eyes (especially the retina), the liver, kidneys, lungs, and fat tissue. The macular region of the eye is yellow in color because of three carotenoids (lutein, zeaxanthin, mesozeaxanthin) which are found in very high amounts.

**Forms:**
- Retinoids: animal-based or synthetics
  - Retinol (alcohol form – Retinyl in supplements)
  - Retinal (aldehyde form)
  - Retinoic acid
  Other retinoids have been developed for such specific uses as in cancer research, and cannot be purchased. They are described as *Vitamin A analogs*.
- Carotenoids: plant-based
Provitamin A: only 50 of about 600 carotenoids qualify as provitamin A compounds. Carotenoids are converted to a natural form of retinol the body is able to use. Six of the best known carotenoids are: alpha-carotene (carrots), beta-carotene (algae), cryptoxanthin (red peppers), lycopene (tomatoes), lutein and zeaxanthin (green foods).

- Palmitate and Acetate are synthetic forms found in supplements and foods.
- Tretinoin and Isotretinoin are pharmaceutical forms used to treat acne and can only be obtained by prescription. They do not meet the body’s requirements for Vitamin A.

Notes:
- Oral retinoid forms can be toxic at high levels over extended periods. However, carotenoids are not toxic no matter how high the dosage; although, continual high dosages can cause the skin to take on an orangey color, unattractive, but not harmful.
- Toxic levels generally occur after many months of consuming in excess of 15,000 IU (children) and 25,000 IU (adults) of the retinoid forms. This sometimes occurs in individuals who are taking vitamin A compounds for skin disorders or in those with poor liver function.
- Diabetics are not able to convert carotene to Vitamin A. Therefore, adding increased amounts will only cause adverse side effects.

Food sources: animal livers; orange, yellow, and green fruits and vegetables

Helper nutrients: B complex, C, D, E, calcium, phosphorus, zinc, and fatty acids

Inhibitors: excessive iron intake, polyunsaturated fats, laxatives, mineral oil, strenuous physical activities during digestion, chemicals (PCB’s, sodium benzoate, nitrites, aflatoxins, DDT etc.), bile and pancreatic dysfunction, cardiac disease, and a vitamin D deficiency

Drugs that deplete: acid-blockers, alcohol, anti-arrhythmics (quinidine), anti-biotics, anti-convulsants, anti-gout, cholesterol-lowering, diuretics, fat blockers, HRTs (androgens), immunosuppressants, laxatives, mineral oil, oral contraceptives, steroids

Notes:
- Vitamin A may help increase the effectiveness of chemotherapy medications.
- Vitamin A may decrease sun sensitivity caused by quinidine.

Actions:
- powerful antioxidant
- vital for eye and skin health
- prevents night blindness, cataracts, and macular degeneration
- essential for maintaining mucus membranes lining the eye
- necessary for tissue growth and repair
- important for proper fetal development
- reduces the severity and complications of measles
- enhances immune system
- helps fight infections
- possesses anti-viral and anti-inflammatory properties
- necessary for reproduction and lactation
- protects against numerous cancers and cardiovascular diseases
- slows aging
- necessary to form and maintain bones, tooth enamel, gums, and soft tissue
- helps digest proteins
- necessary for healthy uterus and sex glands
- helps synthesize RNA
Deficiency symptoms

- night blindness (nyctalopia)
- drying and hardening of the membranes that line the eyes (xerophthalmia)
- dry, itchy, bloodshot eyes
- sties
- corneal thickening / softening
- deterioration of tear ducts, GI tract, salivary glands, lactation ducts
- follicular keratosis, hyperkeratosis, or xeroderma which are caused by an excessive production of keratin, a hard protein, and commonly seen as "goose flesh" that does not disappear
- eczema, acne, skin rashes, premature aging
- rough or dry skin
- dry or brittle hair
- decreased appetite, sense of smell, and vitamin C levels
- increased cancer risks (especially epithelial cell cancers in mouth, skin, lungs, bladder, breast, stomach, cervix)
- fatigue
- reduced weight and growth
- decreased immunity
- increased susceptibility to infections
- sterility
- slow healing
- increased menstrual bleeding and birth defects
- increases in sinusitis, ear and mouth abscesses
- light sensitivity
- reproductive difficulties

Toxic symptoms (detox with high amounts of vitamin C and cease vitamin A intake)

- dry, itchy skin
- profuse sweating
- peeling/scaling/thickening skin
- sore lips
- sparse/coarse/brittle hair
- brittle nails
- decreased eyebrow hair
- increased cranial pressure
- blurred vision
- protruding eyes
- irregular menses
- headaches
- emotional agitation, irritability, depression
- abdominal pain
- decreased appetite and/or nausea
- diarrhea
- muscle weakness
- fatigue
- bone thickening and demineralization
- aching bones or joints
- enlarged spleen/liver/kidneys
- retarded growth
- development of some cancers
History
3500 years ago, the Chinese used a concoction rich in Vitamin A to cure nightblindness; now known as a common Vitamin A deficiency.

The ancient Greeks did the same. Hippocrates prescribed various forms of liver for such conditions.

Modern science, however, did not recognize it as a viable nutrient until the early 1900’s and made a synthetic form in 1947.

How Carotenes Function in the Body
There are over 600 known carotenoids but less than 15 have any significance to human health.

Carotene is actually two vitamin A molecules hooked tail-to-tail. In this form, vitamin A is inactive and, therefore, non-toxic, no matter the dosage. As the body needs vitamin A - and only then - does it split the carotene molecule to make an active form.

Conversion to the active vitamin takes place within the intestinal wall and in the liver, with only about 10% of the carotenoids being converted into Vitamin A at any given time.

Retinoids do not act in the same manner, which is why toxicity can occur. There have not been any reports of toxicity from beta-carotene, despite sustained doses of 500,000 IU daily.

Retinol, on the other hand, can produce toxic symptoms in levels exceeding 25,000 IU per day. Warnings of Vitamin A toxicity rarely make this distinction.

Beta-carotene
The most commonly used and recognized carotenoid is beta-carotene, which is also the easiest to convert to vitamin A internally. As an antioxidant, beta carotene is vital for preventing many diseases.

Carotene can build up in the body, causing the skin to turn to an orangey colour, but this is not cause for alarm. Jaundiced skin may indicate an excessive intake of beta carotene or a liver disease. The only way to distinguish this abnormality from jaundice is to look at the whites of the eyes. Jaundice will turn the whites yellowish, but excessive carotene will not.

Eye Protection
Since vitamin A is an antioxidant, it helps protect against free radicals which attack structural proteins, enzymes, and cell membranes of the eye lens.

Vitamin A is required for the regeneration of rhodopsin, a pigment that was formerly called visual purple. It is found in the rods of the retina, which contains this vitamin. On exposure to light, it is bleached through a series of products, eventually forming ops in and another pigment known as retinaldehyde (visual yellow). As a result of these changes, images are transmitted to the brain through the optic nerve.

A vitamin A deficiency can sometimes produce a condition known as corneal xerosis, which is a hazy, milky, or opaque appearance of the cornea, usually in the lower central area. However, this condition can also be caused by other factors, as well as a vitamin deficiency.

Measles
Measles dramatically increases the need for vitamin A. The virus, a member of the RNA group called paramyxovirus, quickly depletes vitamin A stores. Therefore, a supplement is advised, especially for children who generally have low levels of Vitamin A to begin with and are at a greater risk of succumbing to the disease. When vitamin A is given to children in the third world, the death rate from measles is cut by a minimum of 35%.
**Vitamin D**

**Dosage:** 1000 – 20,000 IU per day of D3

Concentrated amounts in humans are found in the liver, skin, brain, spleen, & bones

**Forms:**
- Cholecalciferol (D3) is considered a prohormone and does not have any activity of its own. It is obtained from dietary (usually sheep lanolin) or skin sources (sun). It is the natural form the body uses & the form seen in quality supplements.
- Ergocalciferol (D2) is a synthetic (usually from an irradiated fungus) not recognized & not well utilized by the body, thus it can reach toxic levels. Often prescribed by doctors and added to foods.
- Doxercalciferol - a lab-created prescription (Hectorol)
- Calcidiol (25-hydroxyvitaminD) – a prehormone formed in the liver from cholecalciferol. Excess calcidiol (which has powerful anti-cancer properties and the most potent steroid hormone) goes directly to body cells to be utilized as needed. Blood tests will measure this form.
- Calcitriol (1,25-dihydroxyvitaminD) – made in the kidneys from calcidiol. Its levels should never be used to determine vitamin D deficiency.

**Notes:**
- Being out in the summer sun until the skin begins to turn pink can make between 10,000 and 50,000 IUs of cholecalciferol in the skin. By the time about 20,000 units are made, the same ultraviolet light that created cholecalciferol, begins to degrade it. Therefore, it is impossible to have toxic levels from sun exposure.
- It is only after D3 is metabolized in the liver and then into other forms in the kidneys that the active forms are produced.
- To date, some thirty-seven forms of vitamin D3 have been isolated and chemically characterized.

** Helpers:** sunshine, vitamins A & C, choline, calcium, & phosphorus

**Inhibitors:** smog, glass barriers (as in windows), ferric iron, rancid fats, sunblockers

**Drugs that deplete:** acid blockers, amphetamines, antacids, antibiotics, anticonvulsants, anti-gout, barbiturates, benzodiazepines, butalbital-containing drugs [butalbital contains aspirin or acetaminophen, a barbiturate, & caffeine], calcium channel blockers, cholesterol-lowering drugs, diet aids, estrogen blockers, fat blockers, laxatives, mineral oil, sedatives, steroids

**Food sources include:** fish liver oils, fatty saltwater fish (salmon, mackerel, tuna, sardines, cod, halibut etc), egg yolks

**Actions:**
- directly influences at least 2000 genes
- necessary for the growth & mineralization of teeth & bones (including those of the inner ear)
- needed for absorption & utilization of calcium & phosphorus
- important for maintaining a regular heartbeat
- necessary for normal thyroid function
- helps with blood clotting
• prevents & treats rickets, osteoporosis, osteopenia, osteomalacia, fractures, Parkinson’s, TB, cancers, heart disease, diabetes, bowel disorders, arthritis and rheumatoid arthritis, MS, nearsightedness, conjunctivitis, psoriasis
• inhibits tumor growth internally & externally
• helps stabilize nervous system
• helps prevent at least 16 types of cancers
• helps control blood sugar levels
• helps the brain detoxify heavy metals
• reduces inflammation
• enhances immunity

Deficiency symptoms:
• rickets
  • (in children) knock-knees, bowed legs, spinal curvatures, pigeon breast, skull disfigurements, dental problems
• osteopenia, osteoporosis, osteomalacia
• decreased bone density, calcium/phosphorus absorption, kidney function, immunity, and energy
• increased risk for falls, fractures, cancer (especially colon & breast), intestinal problems (such as IBS or Crohn’s disease), diabetes, MS (multiple sclerosis), arthritis and rheumatoid arthritis, heart disease, fibromyalgia, autism, asthma
• increased bone and teeth softening, hearing loss, poor cognitive function
• depression, mood swings, Seasonal Affect Disorder (SAD), fatigue
• muscle pain, weakness, numbness, tingling, or spasms
• decreased muscle tone
• sleep irregularities
• soft, ridged fingernails
• parathyroid problems
• obesity
• chronic pain

Toxic symptoms: (detoxify with vitamin C - There are no known toxicities associated with D3)
• thirst
• increased urination and urgency of urination
• kidney failure
• diarrhea or constipation
• nausea
• decreased appetite and weight
• headaches
• depression
• increased susceptibility to sunstroke
• calcium deposits in blood vessels/liver/lungs/kidneys/stomach/skin
• depleted magnesium levels
• body aches, stiffness, weakness
• abnormal bone growth in children
• numbness/tingling in bones and fingertips
• increased blood pressure

History
In 1824, cod liver oil, long known as a folk medicine, was found to be important in the treatment of rickets, but soon it lost favor with physicians because they could not explain how it worked. Not much has changed since that time in the medical field when it comes to knowledge about nutrients curing illnesses.
**Vitamin D Deficiencies**

**Rickets**
Rickets is commonly thought of as being merely "bowed" legs or "knocked knees." However, it is much more than that. Not only do the weight-bearing bones buckle, but as growth takes place, the head becomes malformed, wrists and ankles become enlarged, and the sternum bows to resemble a pigeon breast. The severity of the changes varies with the degree of vitamin D deficiency.

Even early recognition often escapes trained health care professionals. Infants may be restless and sleep poorly. They may sweat profusely, something which is uncommon in infants, and repeatedly turn its head from side to side.

Later, there will be a delay in the formation of teeth. The infant will have reduced mineralization of the skull or craniotabes, bossing of the skull, and delayed closure of the fontanelle. Sitting and crawling stages will be noticeably delayed.

By the time the "bowed" legs appear, the child is well into the deficiency. Supplements of vitamin D can correct bone structure development but they will not be able to correct deformed bones.

**Osteomalacia**
When a vitamin D deficiency occurs in adults, it produces a condition known as osteomalacia, a softening of the bone, sometimes referred to as the adult form of rickets. It occurs after the epiphyseal growth plates fuse, creating bone-softening deformities of arms, legs, spine, thorax, and pelvis.

Compounding these problems are the accompanying chronic pain and muscle weakness. It is often confused with osteoporosis. However, with osteoporosis, bone fractures are common, but not so in osteomalacia. Studies in the US indicate that almost half of hip fracture victims have a vitamin D deficiency.

**Hearing and Eye Problems**
Vitamin D deficiency not only contributes to rickets and osteoporosis, but also to calcium loss in the bones of the inner ear. Hearing loss may be related to malformation of the middle ear bones or changes that occur to the bones related to a deficiency of vitamin D, especially in the elderly.

Because of the vitamin's effect on the eye muscles, a deficiency can also contribute to nearsightedness. Vitamin D has been used in the treatment of conjunctivitis.

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**Vitamin E**

**Dosage:** 400 to 800 IU per day

**Concentrated amounts in humans** are found mainly in the pituitary gland, adrenal glands, and testes. Smaller amounts are stored for short periods of time in muscle & fat tissues, much like the water-soluble vitamins.

**Forms:** a complete vitamin E encompasses a family of 8 plant-based antioxidants (tocopherols and tocotrienols):
- 4 **tocopherols** (alpha, beta, delta, gamma)
- 4 **tocotrienols** (alpha, beta, delta, gamma)
- d-**alpha** tocopherol is the natural form utilized by the body and found alone in the cheaper vitamin E supplements
• **dl-alpha** tocopherol is the cheaper synthetic form
  • Many supplements now come as having either mixed tocopherols or with both tocopherols and tocotrienols

**Helpers:** vitamins A, B-complex, C, manganese, selenium, phosphorus, essential fatty acids

**Inhibitors:** iron, heat, oxygen, freezing temperatures, food processing, polyunsaturated fatty acids, chlorine, ferrous sulphate (iron), rancid fats & oils

**Drugs that deplete:** amphetamines, antibiotics, antipsychotics, cholesterol-lowering, estrogens, laxatives, mineral oil, oral contraceptives, steroids, thyroid hormones

**Notes:**
  • High doses of vitamin E can interfere with vitamin K activity.
  • Do not take with the ferrous sulphate form of iron. Take at least 8 hours away from each other. This rule does not apply to supplements that contain both. There is no problem with the ferrous gluconate, fumarate, or citrate forms or with preparations that contain both vitamin E and iron together.
  • Do not take large amounts with anticoagulants.
  • Caution should be taken by those who have overactive thyroids, diabetes, high blood pressure, or rheumatic fever. Dosages should increase gradually to the required amount.
  • It can elevate blood pressure in those prone to high blood pressure, but it can lower blood pressure if dosages start small and are slowly increased. This method has also proven effective with diabetics to reduce their insulin levels.
  • Large intakes of Vitamin E (1200 mg. or more) can interfere with the metabolism of vitamin K and, to a certain extent, that of vitamin A absorption. As a result, it is advisable not to exceed 800 mg for 2 weeks before or after surgery.
  • Although vitamin E is considered non-toxic, a child with a vitamin K deficiency should not be taking large doses of the vitamin as it can impair normal blood clotting and aggravate any existing disorder.
  • Those with a history of rheumatic heart disease may not be able to tolerate more than 150-200 IU of vitamin E per day.

**Food sources:** cold-pressed unrefined vegetable oils (olive, non-GMO corn, soy, safflower, wheat germ are highest), nuts, legumes, mustard greens, chard, sunflower seeds, turnip greens, almonds, spinach, olives, papaya, blueberries

**Actions:**
  • potent antioxidant necessary for healthy reproductive organs
  • protects against heavy metals, toxins, & carcinogens
  • protects other fat soluble vitamins against oxidation
  • prevents damage to nerve & cell membranes
  • prevents vitamins A & C from losing their potency in the body
  • helps reduce LDL blood cholesterol while increasing HDL
  • boosts immune system
  • prevents muscle degeneration
  • promotes formation of new blood vessels around damaged areas
  • helps prevent cancers, cardiovascular diseases, cataracts & macular degeneration
  • improves circulation & wound healing
  • treats menopausal & PMS symptoms, diabetes, tardive dyskinesia, fibrocystic breast disease
  • slows the aging process
• reduces internal & external scar tissue formation
• stimulates urine secretion thus lowering some instances of blood pressure
• protects & ensures permeability of capillaries

**Deficiency symptoms:** (rebound deficiency may occur if large doses are halted abruptly)
• ruptured red blood cells and decreased survival time leading to anemia
• faulty absorption of fats & fat-soluble vitamins
• degenerating muscle cell respiration (especially the heart) thus causing weakness, soreness, cramping, ceroid deposits, or angina
• loss of deep tendon reflexes
• decreased function of endocrine glands & peripheral vascular system
• nervous system deterioration especially with balance and coordination
• impaired eye movement (ophthalmoplegia) and visual disturbances
• skin problems: acne, age spots, psoriasis, eczema, easy bruising
• increased need for oxygen
• slow healing
• retention of scars & stretch marks
• wrinkled & dry skin
• cataracts
• enlarged prostate
• poor wound healing
• muscle weakness
• dull, dry hair
• decreased resistance to ozone, radiation, & cancer
• increased risk of cystic fibrosis & pancreatic inflammation
• retarded growth in children
• frequent miscarriages & premature births
• fibrocystic breasts
• PMS or menopausal symptoms
• reduced sperm motility and/or sterility
• increased creatinine in urine

**Toxic symptoms:**
• headaches, dizziness
• nausea
• decreased basal metabolic rate
• fatigue, muscle weakness
• decreased thyroid hormone levels
• slightly increased blood triglycerides, especially in women
• thinner blood and increased bleeding
• decreased blood sugar levels
• blurred vision
• chapped lips
• inflamed mouth
• deterioration of digestion
• decreased sexual organ function
• decreased ability to convert Provitamin A to vitamin A

**History**
The name tocopherol was derived from the Greek words *tokos* (offspring) and *pherein* (to bear). It was formerly known as the anti-sterility vitamin because a deficiency was linked to miscarriages, thus proving its necessity in the reproduction process.
**Deficiency**
A deficiency rarely occurs because of an inadequate intake. It happens more often when malabsorption disorders develop, such as cystic fibrosis, abetalipoproteinemia, chronic cholestatic liver disease, short bowel syndrome, celiac disease, and chronic diarrhea. The most severe malabsorption of vitamin E occurs when bile flow is impaired or when intestinal lipoprotein synthesis is defective. When malabsorption occurs in adults, it generally takes several years before plasma vitamin E decreases to a dangerously deficient range.

Children, on the other hand, who have malabsorption problems from birth, take a relatively short period of time to develop a deficiency. If it is left untreated, neurologic and cognitive problems develop. If a vitamin E deficiency is corrected during the first few years of life, all symptoms can be reversed or prevented. If not dealt with until symptoms are well advanced, limited improvement can be expected.

Vitamin E deficiency primarily affects the posterior columns of the spinal cord, the third and fourth cranial nerve nuclei, large caliber myelinated axons of peripheral nerves, the brain stem, and eventually muscles and the retina.

**Storage**
Unlike other fat soluble vitamins, Vitamin E is stored in the body for a relatively short period of time, much like the B and C Vitamins.

Since Vitamin E is a fat-soluble compound, it is absorbed in a similar manner as fats. It must be broken down by bile acids and secreted from the liver in order to be carried to the absorptive intestinal cells.

Any disorder that decreases the surface area of intestinal cells, such as celiac disease or the surgical removal of parts of the intestine, will result in the malabsorption of Vitamin E as well as other nutrients.

The liver functions as a rapid turnover store of vitamin E, never accumulating large amounts, with 60-70% excreted in the feces. Muscle tissue accounts for much of the stores while adipose tissue is the long-term storage area, accumulating and releasing it slowly.

**Menopause**
The need for Vitamin E during menopause can increase by ten to fifty times the normal amount required in the premenopausal years. Hot flashes have reportedly diminished in some people when supplements of 1200 mg were taken along with 1000 mg of hesperidin (a bioflavonoid).

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**Vitamin F**
*(Essential Fatty Acids)*

When the two EFAs were first discovered in 1923, they were designated as vitamin F. By 1930, they were reclassified as fats rather than vitamins. The FDA stopped the use of the term Vitamin F when some fast food places began advertising *vitamin enriched* for all foods fried in oil.

**Dosage:** 500 to 6000 mg daily of 3-6-9 coldpressed oil (or 1-2 tbsp)

**Fat-soluble**

**Concentrated amounts in humans** are found in the brain (especially omega-3 DHA), the retina of the eye, the heart, and skeletal muscles.

**Forms:**
Omega 3
• ALA – alpha linolenic acid
• LNA – linolenic acid
• SDA – stearidonic acid
• EPA – eicosapentaenoic acid
• DHA – docosahexaenoic acid

**Omega 6**
• LA – linoleic acid
• AA – arachidonic acid
• GLA – gamma linolenic acid
• CLA – conjugated linoleic acid

**Omega 7** (palmitoleic acid) and 9 are not technically essential because the body can produce them from other fatty acids, as long as enough are present.

**Omega 9** (oleic acid and stearic acid)

**Notes:**
• There are only two EFAs known to be essential for humans: ALA and LA. Others are considered to be *conditionally essential*. These include gamma-linolenic acid (GLA – omega-6) and two plant-based saturated fatty acids: lauric acid and palmitoleic acid.
• Most people obtain an excess of Omega 6 in their diets. A healthy person with good nutrition will convert Omega 6 into GLA, but most cannot because their diets are rich in sugar, alcohol, & trans fats, as well as smoking, pollution, stress, aging, viral infections, and other illnesses such as diabetes.
• Almost all studies on Omega 3 fatty acids have been performed using fish oil. However, the few studies that have been done using flaxseed oil indicate equal or better results. Therefore, vegetarians & vegans can have as good (or better) health results from plant-based oils as others do from fish oils.
• Flaxseed oil starts with ALA. Fish oil begins with DHA. The body makes its own DHA & EPA from ALA. The body does not require much DHA since most of it is contained in cell membranes with little replacement being necessary. By contrast, ALA and its compounds are needed for a number of essential functions. Fish oil cannot provide ALA and its substances.
• GLA is the therapeutic fatty acid within Omega-6 that has anti-inflammatory properties. Studies have shown similar results to the EPA found in Omega-3.
• *Never* eat rancid oil. Rancidity creates free radicals which lead to numerous diseases including cancers and heart disease. How do you know when an oil is rancid? Taste it.

**Helpers:** A, B-complex, C, D, E, zinc, magnesium, phosphorus, selenium, other EFAs

**Inhibitors:** heat, light, oxygen, cooking, processing, hydrogenated/trans/long-chain saturated fats, excess dietary cholesterol, environmental stressors (pollution), viral infections, radiation, decreased nutrient levels (especially vitamin C & zinc)

**Drugs that Deplete:** alcohol, estrogens, laxatives, mineral oil

**Food sources include:**
• **Omega 3** – seeds and their cold-pressed oils (chia, flax, hemp, pumpkin, sesame, mustard, black currant), walnuts, Brazil nuts, avocados, dark leafy green vegetables (kale, spinach, purslane, mustard greens, collards, etc), Spirulina, wheat germ oil, fatty fish (salmon, mackerel, sardines, anchovies, albacore tuna, krill)
• **Omega 6** – cold-pressed nut & seed oils, eggs, poultry, processed foods containing fats. GLA is found in the oils of evening primrose, borage, black currant seed, hempseed, sesame, poppy, pumpkin, wheatgerm, and walnut.

• **Omega 7** – sea buckthorn, macadamia nuts

• **Omega 9** – cold-pressed nut, seed and olive oils, avocados, oatmeal

**Actions:**

**Omega-3**
- necessary for the health of all cells
- helps over 60 health conditions relating to allergic and inflammatory conditions, autoimmune disorders, and cardiovascular diseases
- vital for proper functioning of the cardiovascular, reproductive, immune, & nervous systems
- required for normal brain development & function
- decreases depression
- necessary for prostaglandin (hormone-like) production
- provides good skin health
- improves circulation & oxygen uptake
- helps prevent excessive blood clotting
- controls the amount of circulating triglycerides and cholesterol in the blood
- inhibits thickening of the arteries
- helps improve the body’s response to insulin
- helps prevent cancer cell growth and macular degeneration

**Omega-6** (any benefits come from the GLA part)
- helps prevent nerve damage in diabetics & dry eye syndrome
- responsible for producing various beneficial prostaglandins

**Omega-7**
- healthy skin & membranes (including digestive & urogenital)
- assists other EFAs

**Omega-9**
- reduces risk of heart disease & arteriosclerosis
- lowers cancer risks
- helps reduce cholesterol levels
- helps promote healthy inflammatory responses
- helps reduce insulin resistance
- improves immune function

**Deficiency symptoms:**

**Omega 3**
- decreased memory & mental ability (dementia, mood changes)
- tingling sensation in extremities
- poor vision
- increased tendency to form blood clots
- diminished immune function
- increased triglycerides and *bad* cholesterol (LDL) levels
- impaired membrane function
- irregular heart beat
- learning disorders
- menopausal discomforts
- itchiness on the front of the lower legs
- slow growth and development in infants, children, and pregnant women
- weakness
- decreased motor skills
- behavioral changes
- increased blood pressure
- low metabolic rate
- depression
- cardiovascular diseases
- type 2 diabetes
- dry, itchy skin
- dermatitis similar to a zinc or biotin deficiency
- brittle hair & nails
- joint pain

Omega 6
- eczema-like skin eruptions
- hair loss
- liver & kidney degeneration
- behavioral disturbances
- excessive sweating accompanied by thirst
- increased susceptibility to infections
- slow wound healing
- male sterility
- female miscarriages
- arthritis-like (inflammatory) conditions
- heart & circulatory problems
- growth retardation
- depression

Omega 9 (deficiencies depend on having enough Omega-3 and -6 in the diet)
- skin problems - dryness, eczema, bumps on the back of upper arms
- cracking or peeling fingertips
- dandruff or hair loss
- mood changes
- male sterility or female miscarriages
- dry eyes
- craving for fatty foods
- joint stiffness or pain

**Vitamin K**

**Dosage:** 120 - 4500 mcg daily (depending on the form)

**Forms:**

K1 (phyloquinone/phytonadione/ phytonactone – found in plants and found in supplement form). Absorption in humans is via the duodenum and jejunum and then the lymphatic system. It has quick action with a prolonged duration and the most potent of the forms. It is safer than K3 for newborns.

K2 (menaquinone – synthesized by intestinal bacteria and found in supplement form)
- MK-4 (menatetrenone, a synthetic supplement made from tobacco or in a natural form, butter and egg yolks from grass-fed animals)
- MK-7 (menaquinone, derived from natto; a more stable supplement form than MK-4)
K3 (menadione) – a fat-soluble synthetic and the only form which can be toxic, that is, causing hemolytic anemia. Hemolytic anemia happens when the red blood cells die more quickly than the body can reproduce. It also speeds liver damage, producing jaundice, deafness, and severe neurological problems, including retardation in infants.

Notes:

- Newborns are routinely given vitamin K is routinely given to newborns to prevent hemorrhage. Newborns are customarily given 0.5-1.0 mg of vitamin K by injection. Preterm infants are given 1 mg or more and, if needed, repeated a week later.

  Newborns are at a high risk for a deficiency, especially if premature, breastfed, or if the mother is taking anticoagulant medication. Since babies are born with sterile intestines, they have no intestinal bacteria to produce K2, thus making them more susceptible to a deficiency.

  Vitamin K sometimes appears on baby food and formula labels as the additive phytonadione.

- Conditions that impair fat absorption will also impair the absorption of vitamin K, especially antibiotics which destroy the normal intestinal flora needed for vitamin K synthesis.

- Care must be taken with IV injections of vitamin K, since they can cause facial flushing, excessive perspirations, chest tightness, cyanosis, vascular collapse, and shock as well as anaphylaxis.

Helpers: intestinal bacteria, vitamin D

Inhibitors: high doses of other fat-soluble vitamins (A, E), x-rays, radiation, frozen foods, air pollution, sweating, food processing

Drugs that deplete: antibiotics, anticoagulants, anti-convulsants, anti-inflammatory, aspirin and substitutes, barbiturates, cholesterol-lowering, laxatives, mineral oil, sedatives

  Note: Warfarin (Coumadin) is the most recognized medication that counteracts the effects of Vitamin K. On the other hand, Vitamin K does not reverse overdoses of heparin. Those taking warfarin should avoid foods that contain such coumarin derivatives as tonka beans, melilot, sweet clover and sweet woodruff.

Food sources include:

K1 – green leafy vegetables, Brussels sprouts, green beans, asparagus, broccoli, cauliflower, tomatoes, cold-pressed seed oils

K2 – chicken egg yolk, butter, grass-fed cow liver, certain cheeses (from grass-fed animals and not grain-fed), fish oils, fermented soy products such as natto, miso, or kefir

K3 – an additive used in animal feed, including dog and cat food. For humans, it is available only by prescription. K3 is the only form known to have any degree of toxicity (red blood cell death). K3 is commonly used with chemotherapy agents to enhance effectiveness. Since K3 is synthetic and generally regarded as toxic because it generates free radicals, it is certainly not the best choice for improving health.

Actions:

- an enzyme cofactor necessary for blood clotting (prothrombin formation)
- necessary for synthesis of osteocalcin (a protein "glue" that attracts calcium to bone) thus reducing fractures and increasing density
- involved in the formation of MGP (matrix Gla-protein - a powerful inhibitor of soft-tissue calcification [which can lead to atherosclerosis]
- helpful in treating excessive menstrual bleeding
- decreases risk of tumor formation
- cofactor in the prevention of such cellular diseases as IBS and chronic diarrhea

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- prevents formation of varicose veins
- helps prevent heart disease (stops plaque formation)
- reduces risk of Alzheimers
- helpful in treating liver, lung and prostate cancers
- topical vitamin K may help reduce bruising
- has some antioxidant properties

**Deficiency symptoms:**
- decreased blood clotting
- increase in nosebleeds and blood pressure
- diarrhea
- excessive bruising
- hemorrhages, especially in the brain, spinal cord & intestinal tract
- digestive problems, especially with fat malabsorption
- liver or gallbladder problems
- blood vessel hardening
- brittle bones
- varicose veins
- problems with insulin release & blood sugar regulation

**Toxic symptoms:** (which occurs only when using K3)
- flushing
- sweating
- chest constrictions
- severe neural symptoms
- increased bilirubin in blood
- red blood cell breakdown
- anemia
- yellowing of skin (jaundice)

**History**
In the early 1900’s, research was conducted on the cause of pellagra. A US government investigator, Joseph Goldberger, took his study to a Jackson, Mississippi orphanage, where many of the children had the disease. The symptoms disappeared when the children were fed high protein diets of meat, beans, and eggs. His conclusion was that pellagra was caused by a protein deficiency.

By 1930, researchers had isolated the real cause of pellagra as that of niacin. It is now known that the body can produce the niacin it requires from the amino acid tryptophan, even when such foods as meat, beans, and eggs do not contain significant levels of niacin, thus explaining the reason pellagra improved with a protein diet.

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Using chickens, studies in the 1920’s and 30’s in Denmark revealed that blood clotting was slow after certain restricted diets. Through further research, it was found that a special fat soluble vitamin was the cause. By 1940, Dr. Henrik Dam had isolated the vitamin and named it vitamin K for *koagulationsvitamin*, the Danish spelling for the vitamin responsible for clotting.
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