

**Outline of Nutrition**  
**January 2, 2012**

**Contents**

BIOL>Nutrition .....	1
BIOL>Nutrition>Food Group .....	1
BIOL>Nutrition>Food Types .....	1
BIOL>Nutrition>Food Types>Protein .....	2
BIOL>Nutrition>Nutrient .....	2
BIOL>Nutrition>Nutrient>Flavanol .....	3
BIOL>Nutrition>Nutrient>Mineral .....	3
BIOL>Nutrition>Nutrient>Mineral>Metal .....	4
BIOL>Nutrition>Nutrient>Vitamin .....	5
BIOL>Nutrition>Nutrient>Vitamin>Fat-Soluble.....	5
BIOL>Nutrition>Nutrient>Vitamin>Water-Soluble .....	6

**Note:** To look up references, see the Consciousness Bibliography, listing 10,000 books and articles, with full journal and author names, available in text and PDF file formats at [http://www.outline-of-knowledge.info/Consciousness\\_Bibliography/index.html](http://www.outline-of-knowledge.info/Consciousness_Bibliography/index.html).

**BIOL>Nutrition**

**nutrition**

Diets {nutrition} have minerals, vitamins, nutrients, food groups, and diseases.

**hunger in nutrition**

Internal signals initiate and terminate eating {hunger}. Vagus-nerve stop-eating signals come from stomach and gut upper part, as they distend. Hunger not involving vagus nerve detects nutrient amounts. Insulin injections cause hunger. Norepinephrine injection into brain ventricles can increase eating. Brain electric stimulation can increase eating. Lateral-hypothalamus lesions cause starvation.

**BIOL>Nutrition>Food Group**

**cereal group**

Food groups {cereal group} can be grains, with B vitamins.

**dairy group**

Food groups {dairy group} can be milk, cheese, yogurt, and ice cream, with calcium, phosphorus, riboflavin, and vitamin D.

**meat group**

Food groups {meat group} can be red meat, white meat, egg, dried bean, dried pea, and nuts, with protein, iron, phosphorus, thiamin, and niacin.

**vegetable and fruit group**

Food groups {vegetable and fruit group} can have vitamin C: orange, grapefruit, tangerine, strawberry, tomato, cabbage, and green pepper. Vegetable and fruit food group can have iron and vitamin A: dark-green leafy vegetables, deep-yellow vegetables and fruits, carrots, spinach, asparagus, green pepper, and apricot. Vegetable and fruit food group can have cellulose, vitamins, and minerals: beets, celery, corn, cauliflower, lettuce, green beans, potatoes, onions, apples, bananas, grapes, pears, berries, and pineapple.

**BIOL>Nutrition>Food Types**

**carbohydrate as food**

Organic molecules {carbohydrate, nutrition} can be for energy and digestion. Carbohydrates come from fruits, vegetables, and grains.

#### **fat as food**

Organic molecules {fat, nutrition} can be for energy, fatty acids, insulation, and protection. Fat stores fat-soluble vitamins. Fat comes from oils, dairy products, and nuts.

#### **roughage**

Non-digestible organic substances {roughage} {fiber} {bulk} are for intestines, gums, and teeth. Roughage comes from grain, fruit, and vegetables. Plants have molecules that people cannot digest into smaller molecules or absorb across intestinal wall into blood.

### **BIOL>Nutrition>Food Types>Protein**

#### **protein as food**

Organic molecules {protein, nutrition} can be for amino acids, hormones, antibodies, and enzymes. Protein comes from dairy products and animals.

#### **essential amino acid**

Essential amino acids {essential amino acid} are leucine, isoleucine, valine, lysine, methionine, phenylalanine, threonine, tryptophan, arginine, and histidine.

### **BIOL>Nutrition>Nutrient**

#### **nutrient**

Animals select foods to get different chemicals {nutrient}.

#### **allyl sulfide**

Ajoene and similar substances {allyl sulfide} are in garlic, onions, leeks, and chives.

#### **anthocyanin in food**

Anti-oxidants {anthocyanin, nutrition} are in blackberries, raspberries, blueberries, and strawberries.

#### **betaglucan**

Oat-fiber organic molecules {betaglucan} can lower blood fats and LDL cholesterol.

#### **carnitine**

Organic molecules {carnitine} for growth can be methyl donors in lipid metabolism.

#### **choline**

Organic molecules {choline} can be methyl group donors. Cholines build lecithin, acetylcholine, and sphingomyelin. They mobilize fat from liver into blood. Choline can come from methionine.

#### **coenzyme Q**

Organic molecules {coenzyme Q} {ubiquinone} can be for oxidation-reduction, ATP production, and respiratory chain.

#### **flavone**

Hesperidin or rutin {bioflavonoid} {flavone} enhances vitamin-C effects and maintains capillary walls.

#### **glucosolate**

Organic molecules {glucosolate} can be in broccoli, brussels sprouts, cabbage, and kale of brassica family.

#### **inositol**

Organic molecules {inositol} for cell growth can build RNA. Inositol can come from glucose.

**lipoic acid**

Organic molecules {lipoic acid} for growth can make acetyl-CoA, transfer two carbons, and oxidize amino acids.

**lutein**

Organic molecules {lutein} can be in broccoli, brussels sprouts, cabbage, and kale of brassica family.

**lycopene**

Anti-oxidants {lycopene} can be in tomatoes.

**omega-3 fatty acid**

Fatty acids {omega-3 fatty acid} in walnuts, nuts, fish, and flax can lower cholesterol and affect mood.

**BIOL>Nutrition>Nutrient>Flavanol****flavanol**

Organic molecules {flavanol} can relax vascular tissue. Wine, tea, and cocoa have flavanols. Flavanols include catechins.

**catechin**

Black-tea and green-tea organic molecules {catechin} can inhibit polyphenol formation from burnt fish or meat. Epicatechin and other catechins are flavanols.

**BIOL>Nutrition>Nutrient>Mineral****mineral as nutrient**

Minerals {mineral, nutrition} are 4% of human body weight. Essential elements are hydrogen, oxygen, carbon, nitrogen, fluorine, boron, sodium, magnesium, nickel, aluminum, silicon, phosphorus, sulfur, chlorine, potassium, calcium, vanadium, chromium, manganese, iron, cobalt, copper, zinc, selenium, molybdenum, tin, and iodine. Enzymes need essential minerals. Animals like salt.

**chloride as nutrient**

Ions {chloride, nutrition} can be main cell and intercellular-fluid anions. More chloride ion increases protein solubility. Chloride ion flows across cell membrane in nerve and muscle responses, participates in light absorption, and is in stomach hydrochloric acid. Chloride bile salts break up fats.

**fluoride ion as nutrient**

Ions {fluoride ion} can make teeth and bone calcium less water-soluble, and so harder, by replacing the hydroxy in hydroxyapatite. Too much fluoride stains teeth and causes arthritis. Fluoride comes from water.

**iodide ion as nutrient**

Ions {iodide ion} can be in thyroid thyroxin hormone and be for thyroid, growth, water balance, nerves, and circulation. Iodine lack lowers growth and energy levels and enlarges thyroid gland to cause goiter. Iodide comes from seafood and iodized salt.

**phosphorus as nutrient**

Ions {phosphorus, nutrition} can be for energy, bones, and teeth. Phosphorus comes from dairy products, lean meat, and egg yolk. Teeth and bones can have low calcium and phosphorus and cause rickets. Phosphorus is mostly in phosphates. Phosphates act as cell acid buffers, are in bones and teeth, are in ester membrane lipids, transfer in enzyme activation process, aid lipid transport, participate in energy transfers in carbohydrate breakdown and synthesis, enhance anti-oxidants, and are in DNA, RNA, ATP, and coenzymes.

**selenium as nutrient**

Ions {selenium, nutrition} can substitute for sulfur, block peroxide formation, and bind to heavy metals. Perhaps, selenium protects against cancer.

**silicon as nutrient**

Elements {silicon, nutrition} can be for growth, bones, and collagen.

#### **sulfur as nutrient**

Elements {sulfur, nutrition} can be in protein and make thioester bonds in Coenzyme A, thiamin, biotin, lipoic acid, chondroitin sulfate, and sulfolipids.

### **BIOL>Nutrition>Nutrient>Mineral>Metal**

#### **calcium as nutrient**

Metal ions {calcium, nutrition} can be for bones, teeth, blood clotting, body-temperature control, nerves, muscles, and iron absorption.

#### **sources**

Calcium comes from dairy products, green vegetables, and egg yolks.

#### **biology**

High phosphate or high protein in diet increases calcium loss in urine. Citrate, oxalate, and phytate, in unleavened wheat and corn bread, precipitate calcium. Active transport in intestine absorbs calcium. Calcium flows across membranes during muscle contraction and at nerve synapses.

#### **vitamin**

Vitamin D puts calcium in bones.

#### **hormones**

Parathormone liberates calcium from bones. Calcitonin adds calcium to bones.

#### **poison**

Cadmium prevents calcium entry into bones {cadmium poisoning}.

#### **disease**

Osteoporosis bone loss involves calcium and protein loss.

#### **chromium as nutrient**

Metal ions {chromium} can be for insulin production and carbohydrate metabolism.

#### **cobalt as nutrient**

Metal ions {cobalt} can build vitamin B12 in red blood cells. Low cobalt causes anemia.

#### **copper as nutrient**

Metal ions {copper, nutrition} can be in enzymes. Ceruloplasmin protein carries copper in blood. Copper is for myelin production, melanin production, hemoglobin production, respiratory chain, oxygen transport, and iron release. Copper is in blood vessels, tendons, and bone collagen. Bile regulates copper level in blood. Low copper causes red-blood-cell anemia, connective-tissue damage, blood-vessel damage, nerve problems, and low color. There are hereditary copper diseases {Menke's syndrome} {Wilson's disease}.

#### **iron as nutrient**

Metal ions {iron, nutrition} can be in hemoglobin heme molecules that bind oxygen. Iron is in cytochrome respiration proteins. Low iron causes low energy and anemia. Tissues can have too much iron, causing hemosiderosis. Iron comes from lean meat, liver, egg yolk, green leafy vegetables, grains, and raisins.

#### **magnesium as nutrient**

Metal ions {magnesium, nutrition} can be in ATP, phosphate-transferring enzymes, and chlorophyll. Magnesium is for enzymes and bones. It is for acetyl-CoA production, muscle contraction, RNA synthesis, DNA synthesis, and protein synthesis. Kidneys regulate magnesium. Magnesium comes from grains, vegetables, dairy products, nuts, and fruits.

#### **manganese as nutrient**

Metal ions {manganese} can be in mitochondria enzymes, thyroid, bones, nerves, mucopolysaccharides, urea, fatty acids, cholesterol, and prothrombin.

#### **molybdenum as nutrient**

Metal ions {molybdenum} can be in enzymes for copper absorption, energy transfer, uric-acid formation, and aldehyde oxidation.

#### **potassium as nutrient**

Metal ions {potassium, nutrition} can be main cell-fluid cations and be for nerves and muscles. More potassium ion increases protein solubility. Potassium flows across cell membranes in nerve and muscle responses. Potassium is for light absorption. Potassium bile salts break up fats. Potassium comes from seafood, dairy products, fruits, potatoes, sweet potatoes, and vegetables.

#### **sodium as nutrient**

Metal ions {sodium, nutrition} can be main intercellular-fluid cations. More sodium ion increases protein water solubility. Sodium flows across cell membranes in nerve and muscle responses. Sodium is for light absorption. Sodium bile salts break up fats.

#### **tin as nutrient**

Metal ions {tin, nutrition} can be trace metals.

#### **vanadium as nutrient**

Metal ions {vanadium} can be in bones, teeth, and lipids and be for reproduction metabolism.

#### **zinc as nutrient**

Metal ions {zinc, nutrition} can be in enzymes for alcohol breakdown, glycolysis, TCA cycle, and DNA production and in cytochromes, amino acids, albumin, glycoprotein, and RNA nucleoproteins. Low zinc damages hair and nails and can cause sterility, low appetite, poor growth, bad temper, and slow learning.

### **BIOL>Nutrition>Nutrient>Vitamin**

#### **vitamin**

Organic molecules {vitamin, nutrition}| can be coenzymes or coenzyme precursors.

#### **hydroxyl donor**

Organic molecules {hydroxyl donor} can be in copper systems, be anti-oxidants, activate enzyme systems, participate in energy production. Hydroxyl donors are in thyroid hormone, steroid hormone, hydroxyproline, lysine, serotonin, and norepinephrine synthesis.

### **BIOL>Nutrition>Nutrient>Vitamin>Fat-Soluble**

#### **fat-soluble vitamin**

Vitamins {fat-soluble vitamin}| can be in fat. Fat-soluble vitamin slowly deplete from body.

#### **beta-carotene**

Organic molecules {beta-carotene} can be in carrots and sweet potatoes. Sweet potatoes {batata} are in Caribbean.

#### **vitamin A**

Organic molecules {vitamin A} {retinol} can be in rod-cell rhodopsin protein and mucus and bone chondroitin sulfate. Vitamin A builds keratin and steroids. Adrenal cells and sex cells need it. Vitamin A is for growth, skin, mucus, teeth, infection resistance, night vision, eyes, and lungs. Low vitamin A causes easy infection, appetite loss from less saliva, and hair loss. Vitamin A comes from liver, dairy products, egg yolk, sweet potatoes, and dark green and yellow vegetables.

#### **vitamin D**

Organic molecules {vitamin D} {calciferol} can maintain blood calcium and phosphate.

#### **purpose**

Vitamin D is for bone and teeth mineralization, together with parathormone. Vitamin D causes intestine and bone calcium release and kidney phosphate absorption.

#### **forms**

Vitamin D has two forms. Sunshine ultraviolet-B light can make Vitamin D<sub>3</sub> [3 is subscript], which special skin cells {keratinocyte} can convert to 7-dehydrocholesterol. Plants can make Vitamin D<sub>2</sub> [2 is subscript], which liver can convert to 25-hydroxyvitamin D, which kidney converts to 1,25-hydroxyvitamin D. In cell nucleus, 1,25-hydroxyvitamin D attaches to vitamin-D receptor (VDR) protein, which works with retinoid-x receptor (RXR) protein to make complexes that bind to DNA-response elements for more than 1000 genes.

#### **deficiency**

Low vitamin D causes weak bones and rickets or cause bad bones {osteomalacia}.

#### **sources**

Vitamin D comes from cod, tuna, salmon, mackerel, sardines, shitake mushroom, egg yolk, and vitamin-D milk. Sunlight on skin makes vitamin D from precursor.

#### **vitamin E**

Organic molecules {vitamin E} {tocopherol} can be anti-oxidants. Vitamin E prevents free-radical formation from peroxides. It is for polyunsaturated fatty acids, vitamin A, and vitamin K metabolism. It is for reproduction. Low vitamin E causes problems with cell structures, breaks red blood cells, causes lipofuscin in other cells, and causes sterility. Vitamin E comes from nuts, plant oils, dried beans, eggs, and brown rice.

#### **vitamin F**

Linoleic acid fatty acid {vitamin F} is in membranes and builds prostaglandins.

#### **vitamin K**

Organic molecules {vitamin K} {menadione} in liver and blood can aid coagulation and build prothrombin and clotting factors VII, IX, and X. Intestine bacteria make vitamin K. Vitamin K comes from tomato, green vegetables, and plant oils.

### **BIOL>Nutrition>Nutrient>Vitamin>Water-Soluble**

#### **water-soluble vitamin**

Vitamins {water-soluble vitamin}| can dissolve in water, have no storage location, and quickly deplete from body.

#### **biotin**

Organic molecules {biotin} can carboxylate oxaloacetate to pyruvate, participate in fatty-acid synthesis, and build pyrimidines and amino acids.

#### **folic acid**

Organic molecules {folacin} {folic acid} {folate} can carry methyl groups for nucleic-acid synthesis, cell division, methylations, amino-acid modifications, and choline, methionine, serine, and histidine production. Folic acid is in broccoli, Brussels sprouts, cabbage, kale of brassica family. Glutamate is in tetrahydrofolate, which carries methyl, methylene, formyl, formimino, and methenyl groups to oxidize or reduce them.

#### **niacin**

Organic molecules {niacin} can be in NAD and NADP, carry hydrogens in oxidation-reduction reactions, participate in glycolysis, convert pyruvate to acetyl-CoA, deaminate amino acids, participate in fatty-acid synthesis and fatty-acid oxidation, build steroids, and break down drugs and toxins. Niacin is in citric acid cycle, respiratory chain, and hexose monophosphate shunt. Low niacin affects nerves and GI tract, makes dark scaly skin, and causes easy infection.

#### **pantothenic acid**

Organic molecules {pantothenic acid} can be in coenzyme A. Coenzyme A transfers acetyl units. Coenzyme A makes activated acetate for lipids, proteins, carbohydrates, cholesterol, and phospholipid. Coenzyme A breaks down ketogenic amino acids, acetylcholine, and porphyrin.

#### **vitamin B**

Organic molecules {vitamin B} can be for growth, nerves, alertness, digestion, skin, eyes, and blood. Vitamin B comes from grains, liver, lean meat, dairy products, and dried beans and peas.

#### **vitamin B1**

Organic molecules {vitamin B1} {thiamin} can make thiamin pyrophosphate to remove carbon dioxide or to transfer acetyls, build acetyl-CoA from pyruvate, build succinyl-CoA from alpha-ketoglutarate, participate in hexose monophosphate shunt, and make acetylcholine for nerve impulses. Low vitamin B1 causes beriberi, polyneuritis, nausea, and edema.

#### **vitamin B2**

Organic molecules {vitamin B2} {riboflavin} can help make FMN and FAD, help make flavoproteins, carry hydrogens in oxidation-reduction reactions, participate in fatty-acid synthesis and fatty-acid oxidation, deaminate amino acids, and be in respiratory chain. Low vitamin B2 causes tissue changes, cracks in mouth corners {cheilosis}, dermatitis, reddening, and nerve changes.

#### **vitamin B6**

Pyridoxal-phosphate molecules {vitamin B6} {pyridoxine} can carry amino acids across intestinal and blood-vessel walls, carry amino groups in deaminations and aminations, transfer sulfur in sulfur-containing amino acids, remove carbon dioxide in decarboxylations, and form red blood cells. Vitamin B6 helps synthesize niacin, porphyrin, serotonin, gamma-aminobutyric acid, histamine, norepinephrine, folic acid, unsaturated fatty acids, cholesterol, bile acids, acetylcholine, and glucose from glycogen. Low vitamin B6 causes low energy.

#### **vitamin B12**

Organic molecules {vitamin B12} {cobalamin} can carry methyl groups, carry hydrogens to keep sulfhydryls reduced, aid ileum fat absorption, aid cell division, build red cells, and make methionine, folic acid, nucleic acid, and porphyrin. Low vitamin B12 causes pernicious anemia.

#### **vitamin C**

Organic molecules {vitamin C} {ascorbic acid} can reduce iron for absorption and storage in ferritin, convert folic acid to active folinic acid, deaminate protein, and donate sulfate as ascorbate-3-sulfate. Vitamin C is for collagen, wounds, blood clotting, blood vessels, iron absorption, teeth, gums, growth, and bone metabolism.

#### **deficiency**

Low vitamin C causes arthritis, scurvy, blood-clotting defects, easy infection, hair-follicle spots, gum swelling and bleeding, anemia, poor healing, dry skin, and lethargy.

#### **sources**

Vitamin C comes from citrus fruit, green leafy vegetables, broccoli, brussels sprouts, cabbage, kale, tomatoes, potatoes, sweet potatoes, melons, apples, and strawberries.