

Vitamins and Nutrition

I. Vitamins

II. Water Soluble vitamins

Table 10.1 Properties of the water-soluble vitamins

Water-soluble vitamin	Major roles	Deficiency symptoms	Significant sources
(a) Thiamine (B ₁)	Nerve function, energy generation, supports normal appetite	Edema, enlarged heart, heart damage, weakened muscles, paralysis	Pork, whole and enriched grains, legumes, sunflower seeds
(b) Riboflavin (B ₂)	Energy generation, supports normal vision and skin health	Light sensitivity, skin inflammation and lesions	Liver, milk, yogurt, whole and enriched grains, leafy greens
(c) Niacin (B ₃)	Energy generation, supports skin health, supports nervous and digestive systems	Diarrhea; inflammation of mouth, gums, and tongue; dermatitis; fatigue; depression	All protein-containing foods, especially chicken, beef, tuna, milk, eggs; enriched grains, peanuts
(d) Pantothenic acid (B ₅)	Energy metabolism	Nausea, headache, fatigue, insomnia	Liver, mushrooms, whole grains, avocados, broccoli
(e) Pyridoxine (B ₆)	Fat metabolism, helps to make red blood cells	Headache, anemia, nausea, smooth tongue, cracks at corners of mouth, dermatitis, muscle disruption	Meat, fish, poultry, whole grains, legumes, leafy greens, seeds

Table 10.1 Properties of the water-soluble vitamins

Water-soluble vitamin	Major roles	Deficiency symptoms	Significant sources
(f) Biotin (B ₇)	Coenzyme in glucose production and fat synthesis	Dermatitis, depression, hair loss, loss of appetite, nausea	Organ meats, fish, egg yolks, whole grains, soybeans
(g) Folic acid (B ₉)	Synthesis of RNA and DNA, new cell formation	Anemia (large cell type), impaired growth, diarrhea, frequent infections, smooth tongue, depression, confusion, weakness	Liver, leafy greens, legumes, seeds
Vitamin B ₁₂	Coenzyme in folic acid metabolism, nerve function, new cell synthesis	Pernicious anemia, anemia, degeneration of nerve function, smooth tongue, fatigue, hypersensitive skin	Animal products including cheese, milk, eggs
(h) Vitamin C	Collagen synthesis, antioxidant, amino acid metabolism, immune system support, assists in wound healing, iron absorption	Anemia (small cell type), bleeding gums, loosened teeth, muscle degeneration, fragile bones	Citrus fruit, strawberries, greens, broccoli

*Letters refer to the structures shown in Figure 10.1. The structure of vitamin B₁₂ is very complex, so we have not illustrated it.

III. Fat Soluble vitamins

Table 10.2 Properties of fat-soluble vitamins

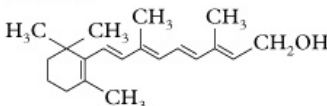
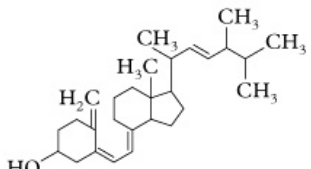
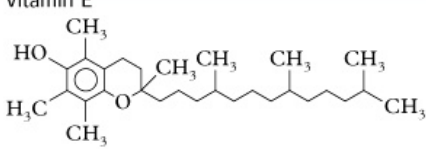
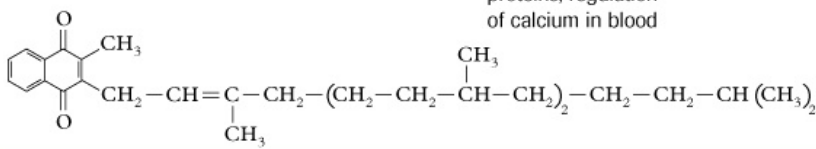
Fat-soluble vitamin	Major roles	Deficiency symptoms	Significant sources
Vitamin A 	Vision, growth, reproduction, immune function, cell development, bone and tooth growth	Night blindness, impaired growth, anemia, diarrhea, frequent infections	Liver, fortified milk, cheese, eggs, orange-colored fruits and vegetables, leafy greens, broccoli
Vitamin D 	Absorption of calcium and phosphorus, bone maintenance	In children, misshapen bones and retarded growth; in adults, softening of bones, lax muscles	Tuna, salmon, fish oils, fortified milk, egg yolk, butter, margarine, cereals; synthesized in the body with help of sunlight

Table 10.2 Properties of fat-soluble vitamins

Fat-soluble vitamin	Major roles	Deficiency symptoms	Significant sources
Vitamin E 	Antioxidant, protects cell membranes	Breakdown of red blood cells, anemia, nerve damage	Egg yolks, leafy greens, whole grain products, wheat germ, nuts, seeds, corn oil, safflower oil, soybean oil
Vitamin K 	Syntheses of blood-clotting proteins, regulation of calcium in blood	Hemorrhaging	Beef liver, egg yolk, legumes, leafy greens, cabbage family; synthesized by bacteria in digestive tract

IV. Food Additives

Table 10.3 Food colorings certified and commonly used in the U.S.

Official name	Common name	Hue	Common food uses
FD&C Blue No. 1	Brilliant Blue FCF	Bright blue	Beverages, dairy product powders, jellies, confections, condiments, icings, syrups, extracts
FD&C Blue No. 2	Indigotine	Royal blue	Baked goods, cereals, snack foods, ice cream, confections, cherries
FD&C Green No. 3	Fast Green FCF	Sea green	Beverages, puddings, ice cream, sherbet, cherries, confections, baked goods, dairy products
FD&C Red No. 40	Allura Red AC	Orange-red	Gelatins, puddings, dairy products, confections, beverages, condiments

Table 10.3 Food colorings certified and commonly used in the U.S.

Official name	Common name	Hue	Common food uses
FD&C Red No. 3	Erythrosine	Cherry-red	Cherries in fruit cocktail and in canned fruits for salads, confections, baked goods, dairy products, snack foods
FD&C Yellow No. 5	Tartrazine	Lemon yellow	Custards, beverages, ice cream, confections, preserves, cereals
FD&C Yellow No. 6	Sunset Yellow	Orange	Cereals, baked goods, snack foods, ice cream, beverages, dessert powders, confections

Source: U.S. FDA website www.cfsan.fda.gov/~lrd/colorfac.html