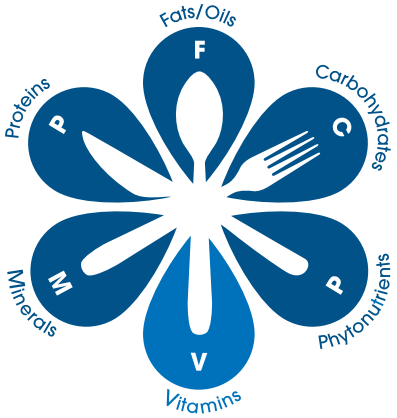
THE INSTITUTE FOR FUNCTIONAL MEDICINE®

Micronutrients:

Vitamins

Vitamins are a group of nutrients that are essential for normal cell function, growth, and development. While some vitamins are made by the body, there are 13 vitamins that the human body can't manufacture. They are known as essential vitamins, because it is essential for us to consume them. Essential vitamins are grouped into two categories: fat-soluble[1] and water-soluble.[2]



Micronutrients are nutrients the body needs small amounts of in order to function properly. This class of nutrients includes minerals, vitamins, and phytonutrients.

Fat-Soluble Vitamins

Vitamins that require fat and bile for absorption in the body are known as fat-soluble vitamins. They are stored in the fat cells and liver until the body needs them, so they do not need to be consumed every day. The body can't eliminate these vitamins as easily as water-soluble vitamins. In fact, excess fat-soluble vitamins can accumulate in the body and cause damage, so it's important to consume them in appropriate amounts. There are four essential fat-soluble vitamins: Vitamins A, D, E, and K. The table below lists these vitamins with their best food sources.

Fat-Soluble Vitamin	Health Benefits	Best Food Sources
Vitamin A (Carotenoids) (Retinol)	• Cell growth and development[3] • Controlling inflammation[4] • Eye health and vision[5] • Gene expression[6] • Immune system function[7] • Prenatal and postnatal development[8] • Red blood cell production[9] • Reproductive health[10]	Bell peppers, bok choy, cantaloupe, carrots, dark leafy greens (collard greens, kale, spinach, Swiss chard, etc.), fish, milk, liver, sweet potato, tropical fruits[11,12]
Vitamin D (D2, ergocalciferol) (D3, cholecalciferol)	• Blood sugar regulation[13] • Bone development and maintenance[14] • Cell growth and development[15] • Immune system function[16] • Insulin secretion[17] • Metabolism of calcium[18,19]	Egg yolks, fortified foods (milk, orange juice, soy milk, etc.), liver (beef), mackerel, mushrooms, salmon, sardines, tuna[15] Note: The best source for vitamin D is natural sunlight.[20]
Vitamin E (alpha, beta, delta, and gamma) (Tocotrienol) (Tocopherol)	• Antioxidant protection[21] • Cognition and brain health[22] • Eye health and vision[23] • Immune system function[24]	Almonds, asparagus, avocado, dark leafy greens (beet greens, mustard greens, spinach, Swiss chard, turnip greens, etc.) sunflower seeds[25,26]

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Fat-Soluable Vitamins (continued)

Fat-Soluble Vitamin	Health Benefits	Best Food Sources
Vitamin K (K1, phylloquinone) (K2, menaquinone)	• Blood clotting[27] • Bone development and maintenance[28] • Cardiovascular health[29] • Cellular function[30] • Soft tissue integrity (prevents calcification)[31,32]	Asparagus, broccoli, bok choy, Brussels sprouts, cabbage, cauliflower, dark leafy greens (beet greens, collard greens, kale, mustard greens, spinach, Swiss chard, turnip greens, etc.), parsley[33]

Water-Soluble Vitamins

Vitamins that can dissolve in water are known as water-soluble vitamins. They are used by the body right away and are not stored in tissues. Essential water-soluble vitamins must be consumed daily. Any water-soluble vitamins that the body doesn't need are eliminated through the urine.

Water-Soluble Vitamin	Health Benefits	Best Food Sources
Biotin (B7)	• Blood sugar balance[34] • Prenatal development[35] • Skin, hair, and nail health[36]	Almonds, carrots, eggs, liver, oats, onions, peanuts, salmon, sweet potato, tomatoes, whole-grain cereals, walnuts[37]
Vitamin B5 (Pantothenic Acid) (Panthenol)	• Cardiovascular health[38] • Energy production[39] • Fat metabolism[40] • Skin health/wound healing[41]	Avocado, broccoli, chicken, fish, lentils, mushrooms (crimini, shiitake), organ meats (liver, kidney), peas, shellfish, sweet potato, turkey, yogurt; found in most other foods[42,43]
Vitamin B1 (Thiamin) (Thiamine)	• Antioxidant protection[44] • Cancer prevention[45,46] • Carbohydrate metabolism[47] • Cardiovascular health[48] • Cognition and brain health[49] • Energy production[44] • Nervous system support[50]	Barley, beans (black, lima, navy, pinto, etc.), lentils, oats, peas, sunflower seeds[51,52]
Vitamin B2 (Riboflavin) (FMN, Flavin mononucleotide) (FAD, Flavin adenine dinucleotide)	• Antioxidant protection[53] • Cardiovascular health[54] • Energy production[55] • Metabolism of carbohydrates, fat, and protein[56] • Migraine prevention[57-59] • Red blood cell production[60]	Almonds, asparagus, beef, broccoli, cheese, chicken, dark leafy greens (beet greens, spinach, etc.), eggs, halibut, milk, mushrooms (crimini), salmon, soybeans, spinach, yogurt[61,62]

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Water-Soluable Vitamins (continued)

Water-Soluble Vitamin	Health Benefits	Best Food Sources
Vitamin B3 (Niacin) (Niacinamide) (Nicotinic acid)	• Antioxidant protection[63] • Blood vessel health[63] • Energy production[64]	Beef, chicken, lamb, rice (brown), salmon, sardines, shrimp, tuna, turkey[65,66]
Vitamin B6 (PL, pyridoxal) (PMP, pyridoxamine 5'phosphate) (PN, Pyridoxine)	• Brain and nervous system health[67,68] • Cardiovascular support[69,70] • Cellular metabolism of amino acids, carbohydrates, and lipids[71] • Controlling inflammation[72] • Hormone function[73] • Immune system function[74] • Liver function[75] • Mood balance[76,77] • Red blood cell production[78,79]	Banana, beef, chicken, potatoes, salmon, spinach, sunflower seeds, sweet potato, tuna, turkey[80]
Vitamin B9 (Folate)	• Brain and nervous system health[81] • Cancer prevention[82-84] • Cardiovascular support[85] • Mood balance[86] • Prenatal development[87] • Red blood cell production[88] • Reproductive health[89,90]	Asparagus, beans (black, garbanzo, kidney, navy, pinto, etc.), broccoli, dark leafy greens (spinach, turnip greens, etc.), lentils[91,92]
Vitamin B12 (Adenosylcobalamin) (Cyanocobalamin) (Deoxyadenosylcobalamin) (Hydroxocobalamin) (Methylcobalamin)	• Bone support[93-95] • Cancer prevention[96] • Cognition and brain health[97] • Cardiovascular support[98] • DNA production[99] • Energy production[100] • Mood balance[101] • Nervous system health[102] • Red blood cell production[103,104]	Beef, cheese, chicken, clams, cod, crab, eggs, lamb, mackerel, milk (cow), mussels, rockfish, salmon, sardines, scallops, shrimp, tuna, turkey, yogurt[105]
Vitamin C (Ascorbic acid)	• Antioxidant protection[106] • Bone health[107,108] • Brain and nervous system health[109] • Cardiovascular support[110] • Eye health and vision[111] • Immune system function[112] • Kidney health (gout prevention)[113,114] • Mood balance[115] • Skin, hair and nail health[116,117]	Bell peppers, broccoli, Brussels sprouts, cabbage, cantaloupe, cauliflower, dark leafy greens, grapefruit, kiwi, lemons, limes, orange, papaya, pineapple, potato, spinach, strawberries, sweet red pepper, tomato[106]

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