Micronutrients for Health

Listed below are all the vitamins and nutritionally essential minerals and their functions, some common dietary sources, and the intake recommendations supported by the National Academy of Medicine. The Linus Pauling Institute's recommendations are noted when different. All recommendations are for adults 19 years of age and older and expressed in micrograms (mg), milligrams (mg), or International Units (IU).

MICRONUTRIENT AND FUNCTION	COMMON DIETARY SOURCES	DAILY INTAKE RECOMMENDATIONS
Vitamin A (Retinol) • Essential for normal vision and immune function • Needed for cell growth and development • Carotenoids like β-carotene can be converted to vitamin A by the liver as needed	*Retinol*: beef liver, fortified cereal, eggs, butter, fortified milk β-*Carotene*: sweet potatoes, pumpkins, carrots, cantaloupes, mangoes, spinach, broccoli, kale, collards, butternut squash	Men: 900 μg RAE* Women: 700 μg RAE Pregnancy: 770 μg RAE Breast-feeding: 1,300 μg RAE *Retinol Activity Equivalents
Thiamin (Vitamin B_1) • Assists the release of energy from carbohydrates and protein	Fortified cereal, bread, pork, enriched white rice, brown rice, peas, macadamia nuts, sunflower seeds, beans, lentils, cantaloupes	Men: 1.2 mg Women: 1.1 mg Pregnancy: 1.4 mg Breast-feeding: 1.4 mg
Riboflavin (Vitamin B_2) • Assists the release of energy from fat, carbohydrates, and protein • Assists several antioxidant enzymes	Milk, fortified cereal, bread, eggs, almonds, clams, spinach, chicken, beef, asparagus, salmon, cheese, broccoli	Men: 1.3 mg Women: 1.1 mg Pregnancy: 1.4 mg Breast-feeding: 1.6 mg
Niacin (Vitamin B_3) • Assists the release of energy from fat, carbohydrates, and protein	Fortified cereal, bread, fish, light-meat chicken and turkey, beef, mushrooms, peanuts, avocados	Men: 16 mg Women: 14 mg Pregnancy: 18 mg Breast-feeding: 17 mg
Pantothenic Acid (Vitamin B_5) • Assists the release of energy from fat, carbohydrates, and protein • Assists fat, cholesterol, steroid hormones, and hemoglobin synthesis	Avocados, yogurt, chicken, sweet potatoes, milk, lentils, eggs, peas, mushrooms, fish, broccoli	Adults: 5 mg Pregnancy: 6 mg Breast-feeding: 7 mg
Vitamin B_6 • Supports a wide variety of metabolic reactions • Assists neurotransmitters, hemoglobin, and DNA production • Influences steroid hormone action	Turkey, chicken, fortified cereal, bread, potatoes (with skin), fish, prunes, bananas, hazelnuts, walnuts, pork, beans	Adults: 1.3 mg Pregnancy: 1.9 mg Breast-feeding: 2.0 mg Men over 50: 1.7 mg Women over 50: 1.5 mg

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Biotin (Vitamin B_7) • Assists the release of energy from fat, carbohydrates, and protein • Assists in glucose production	Beef liver, eggs, salmon, avocados, yeast, whole-wheat bread, pork, cheese	Adults: 30 μg Pregnancy: 30 μg Breast-feeding: 35 μg
Folate (Vitamin B_9) • Required for DNA synthesis • Assists red blood cell production • Prevents neural tube defects • Folic acid, found in supplements and fortified food, is more readily absorbed than naturally occurring folate	*Folate*: beans, lentils, asparagus, spinach, peanuts, peas, corn, chicken, orange juice *Folic Acid*: enriched rice or products made with enriched flours, such as cereal, pasta, or bread	Adults: 400 μg DFE* Pregnancy: 600 μg DFE Breast-feeding: 500 μg DFE *Dietary Folate Equivalents
Vitamin B_{12} • Assists the release of energy from fat and protein • Assists hemoglobin and red blood cell production • Required for nerve function	Clams, mussels, crab meat, salmon, beef, rockfish, milk, cheese, eggs, chicken, turkey, fortified cereal	Adults: 2.4 μg Pregnancy: 2.6 μg Breast-feeding: 2.8 μg **LPI: 100-400 μg from supplements for adults over 50**
Vitamin C • Antioxidant in blood and cells • Augments functional activity of immune cells • Assists collagen, carnitine, serotonin, and adrenaline production	Chili peppers, sweet peppers, guavas, kiwifruits, strawberries, oranges, kale, spinach, broccoli, grapefruit, potatoes, tomatoes	Men: 90 mg (125 mg*) Women: 75 mg (110 mg*) Pregnancy: 85 mg Breast-feeding: 120 mg **LPI: At least 400 mg for all adults** * Smokers
Vitamin D • Maintains calcium and phosphorus balance • Promotes bone health and immune function • Influences cell growth and development	*Dietary*: fish (especially salmon, tuna, herring, sardines, and mackerel), eggs, fortified soy milk, fortified orange juice, fortified milk, fortified cereal *Sunlight*: influenced by season, latitude, skin pigmentation, area of skin exposed, sunscreen use, and age	Adults: 600 IU Pregnancy: 600 IU Breast-feeding: 600 IU Adults over 70: 800 IU **LPI: 2,000 IU from supplements for all adults**
Vitamin E • Antioxidant in cell membranes • Supports normal nerve function • Augments functional activity of immune cells	Olive oil, safflower oil, sunflower oil, almonds, hazelnuts, peanuts, spinach, carrots, avocados	Adults: 22.5 IU Pregnancy: 22.5 IU Breast-feeding: 28.5 IU

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Vitamin K • Assists in blood clotting • Modifies certain proteins to allow for calcium binding	Kale, chard, parsley, broccoli, spinach, watercress, leaf lettuce, cashews, peas, soybean oil, canola oil, olive oil, mayonnaise, naturally fermented food	Men: 120 µg Women: 90 µg Pregnancy: 90 µg Breast-feeding: 90 µg
Calcium • Structural component of bones and teeth • Required for proper nerve transmission and muscle contraction • Influences blood vessel constriction and dilation, and may reduce blood pressure	Milk, yogurt, cheese, tofu (calcium set), fortified beverages, fortified cereal, rhubarb, spinach, almonds, white beans, bok choy, kale, pinto beans, red beans, broccoli	Adults: 1,000 mg Pregnancy: 1,000 mg Breast-feeding: 1,000 mg Men over 70: 1,200 mg Women over 50: 1,200 mg
Chromium • Assists insulin action	Broccoli, grape juice, sweet potatoes, orange juice, beef, turkey, chicken, apples (with peel), green beans, tomatoes, bananas	Men: 35 µg Men over 50: 30 µg Women: 25 µg Pregnancy: 30 µg Breast-feeding: 45 µg Women over 50: 20 µg
Copper • Assists in energy production and iron utilization • Assists in neurotransmitter synthesis • Maintains integrity of connective tissue • Assists antioxidant enzymes	Beef liver, oysters, crab meat, clams, sunflower seeds, kale, cashews, lentils, beans, mushrooms, cocoa powder, raisins, peanut butter	Adults: 900 µg Pregnancy: 1,000 µg Breast-feeding: 1,300 µg
Fluoride • Structural component of bones and teeth	Fluoridated water, crab meat, beans, black tea, raisins, cereal, fish, fruit juice	Men: 4 mg Women: 3 mg Pregnancy: 3 mg Breast-feeding: 3 mg
Iodine • Component of thyroid hormones	Cod, iodized salt, potatoes (with skin), milk, shrimp, turkey, navy beans, tuna, eggs, seaweed	Adults: 150 µg Pregnancy: 220 µg Breast-feeding: 290 µg
Iron • Component of hundreds of enzymes • Needed for synthesis of hemoglobin • Assists antioxidant enzymes • Required for synthesis of DNA, amino acids, collagen, neurotransmitters, and certain hormones • Critical for normal immune function	Beef, fortified cereal, beans, oysters, molasses, lentils, firm tofu, kidney beans, cashews, spinach, potatoes (with skin), shrimp, light tuna, eggs, tomatoes, dark-meat chicken and turkey, raisins, prunes	Men: 8 mg* Women: 18 mg Pregnancy: 27 mg Breast-feeding: 9 mg Adults over 50: 8 mg* *Men and postmenopausal women should avoid taking iron-containing supplements.
Magnesium • Structural component of bones • Assists in hundreds of enzyme reactions involved in the synthesis of DNA and proteins • Required for proper nerve conduction and muscle contraction	Pumpkin seeds, almonds, cashews, beans, spinach, milk, figs, brown rice, cocoa powder, molasses, peanuts, pineapple, okra, milk, bananas	Men: 400 mg Men over 30: 420 mg Women: 310 mg Women over 30: 320 mg Pregnancy: 350-360 mg Breast-feeding: 310-320 mg

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Manganese • Component of antioxidant enzymes • Facilitates bone development • Helps make and break down glucose and proteins	Brown rice, oatmeal, spinach, pineapples, almonds, pecans, molasses, whole-wheat bread, sesame seeds, peanuts, beans, sweet potatoes, tea	Men: 2.3 mg Women: 1.8 mg Pregnancy: 2.0 mg Breast-feeding: 2.6 mg
Molybdenum • Assists in the metabolism of proteins, DNA, drugs, and toxins	Beans, lentils, peas, grain, nuts	Adults: 45 µg Pregnancy: 50 µg Breast-feeding: 50 µg
Phosphorus • Structural component of bones and teeth • Structural component of DNA • Structural component of cell membranes • Assists in energy production and storage	Milk, yogurt, salmon, halibut, lentils, beef, peanuts, sunflower seeds, beans, chicken, turkey, almonds, cheese, eggs, whole-wheat bread	Adults: 700 mg Pregnancy: 700 mg Breast-feeding: 700 mg
Potassium • Maintains fluid and electrolyte balance • Required for proper nerve conduction and muscle contraction • Lowers blood pressure	Beans, potatoes (with skin), prunes, raisins, acorn squash, bananas, spinach, tomato juice, artichokes, molasses, tomatoes, oranges	Men: 3,400 mg Women: 2,600 mg Pregnancy: 2,900 mg Breast-feeding: 2,800 mg
Selenium • Component of antioxidant enzymes • Influences thyroid hormone function	Brazil nuts (from selenium-rich soil)*, crab meat, salmon, halibut, pasta, pork, shrimp, whole-wheat bread, brown rice, beef, light-meat chicken, milk, black walnuts *A single nut may exceed selenium recommendations.	Adults: 55 µg Pregnancy: 60 µg Breast-feeding: 70 µg
Sodium • Maintains fluid and electrolyte balance • Required for proper nerve conduction and muscle contraction • Increases blood pressure	Baked goods, processed meat, restaurant food, pizza, canned soups, table salt Most Americans consume too much sodium. It is recommended to keep sodium intake under 2,300 mg/day to reduce your risk of chronic disease. This is roughly equivalent to the amount of sodium found in one teaspoon of table salt.	Adults: 1,500 mg* Pregnancy: 1,500 mg Breast-feeding: 1,500 mg * the amount found in about 2/3 tsp of table salt
Zinc • Assists in hundreds of enzyme reactions • Assists in hemoglobin production • Assists antioxidant enzymes • Supports immune function	Oysters, beef, crab meat, dark-meat chicken and turkey, pork, yogurt, milk, cashews, chickpeas, almonds, peanuts, cheese	Men: 11 mg Women: 8 mg Pregnancy: 11 mg Breast-feeding: 12 mg

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This information and more can be found in the Linus Pauling Institute's Micronutrient Information Center:
lpi.oregonstate.edu/mic