

TABLE 34-1

NUTRIENTS RELEVANT TO ORAL HEALTH

NUTRIENT	FUNCTION	DEFICIENCY DISEASE	FOOD SOURCE
Vitamin A (Retinol, Provitamin A carotene)	<ul style="list-style-type: none"> • Fat soluble • Antioxidant • Bone and tooth development • Skin and mucous membrane integrity • Cell differentiation; essential for reproduction • Vision in dim light • Immune system integrity 	<ul style="list-style-type: none"> • Night blindness • Xerophthalmia • Poor growth • Keratinization of epithelium • Dry, scaly skin • Toxic in large doses: (double vision, hair loss, dry mucous membranes, joint pain, liver damage) 	Egg yolk, liver, fish liver oils, fortified milk, cream, cheeses; green leafy vegetables, orange, red, yellow pigmented fruits and vegetables
Vitamin D (Calciferol)	<ul style="list-style-type: none"> • Fat soluble • Aids in the absorption of calcium and phosphorus • Mineralization of bone 	<ul style="list-style-type: none"> • Rickets in children • Osteomalacia in adults • Osteoporosis • Toxic in large doses: (calcification of soft tissues, growth retardation) 	Exposure to UV sunlight, fortified milk, fish oils
Vitamin E (Tocopherol)	<ul style="list-style-type: none"> • Fat soluble • Antioxidant 	<ul style="list-style-type: none"> • Low incidence of deficiency • Low toxicity 	Whole grains, wheat germ, plant oils, margarines, legumes, seeds, nuts, greens
Vitamin K (Quinone)	<ul style="list-style-type: none"> • Fat soluble • Synthesis of prothrombin in blood clotting and bone proteins 	<ul style="list-style-type: none"> • Prolonged clotting time • Hemorrhage • Toxic in large doses; (patients on blood thinners need to limit use in diet) 	Synthesized by intestinal bacterial flora; dark green leafy vegetables, liver
Thiamin (B₁)	<ul style="list-style-type: none"> • Acts as coenzyme in carbohydrate and amino acid metabolism 	<ul style="list-style-type: none"> • Essential for synthesis of acetylcholine for healthy nerves • Beriberi: weight loss, fatigue, edema, depression • Toxicity: not seen 	Enriched whole grains and cereals, pork, meats, poultry, nuts, seeds, legumes
Riboflavin (Vitamin B ₂)	<ul style="list-style-type: none"> • Coenzyme in energy metabolism of fat, carbohydrate, and protein 	<ul style="list-style-type: none"> • Ariboflavinosis • Angular cheilosis • Growth failure • Eye disorders • Toxicity: not seen 	Milk, cheese, enriched and whole grains and cereals, rice, mushrooms, liver
Niacin (Vitamin B₃)	<ul style="list-style-type: none"> • Coenzyme in energy metabolism of fat, carbohydrate, and protein 	<ul style="list-style-type: none"> • Pellagra: diarrhea, dermatitis, dementia and death • Toxicity not seen in food sources • Toxicity with large doses of supplements for treatment of hypercholesterolemia: (skin redness and flushing, gastric ulcers) 	Enriched whole grains and cereals, rice, meat, poultry, fish, green leafy vegetables
Pyridoxine (Vitamin B ₆)	<ul style="list-style-type: none"> • Coenzyme in amino acid and lipid metabolism • Hemoglobin synthesis • Homocysteine metabolism 	<ul style="list-style-type: none"> • Dermatitis • Depression • Convulsions • Peripheral neuritis • Toxicity not seen in food sources • Toxicity from supplements: neuropathy, irreversible nerve damage 	Widespread food sources with exception of fat and sugar
Cobalamin (Vitamin B ₁₂)	<ul style="list-style-type: none"> • Maturation of RBC • Requires Intrinsic Factor from parietal cells for absorption • Cofactor in folate and homocysteine metabolism 	<ul style="list-style-type: none"> • Pernicious anemia secondary to lack of intrinsic factor and total vegan diet • Toxicity: not seen 	All animal foods, fortified cereals

(continued)

TABLE 34-1		NUTRIENTS RELEVANT TO ORAL HEALTH (<i>Continued</i>)	
NUTRIENT	FUNCTION	DEFICIENCY DISEASE	FOOD SOURCE
Folate (Folic Acid)	<ul style="list-style-type: none"> • Maturation of RBC • DNA synthesis • Homocysteine metabolism 	<ul style="list-style-type: none"> • Megaloblastic anemia, • Neural tube defects: Spina bifida • Masks B12 deficiency • Toxicity not seen 	Green leafy vegetables, fruits, legumes, fortified grains
Ascorbic Acid (Vitamin C)	<ul style="list-style-type: none"> • Antioxidant • Collagen synthesis • Wound healing • Aids in absorption of iron 	<ul style="list-style-type: none"> • Scurvy • Poor wound healing • Petechial hemorrhages • Increased periodontal symptoms • Toxicity: potential for rebound scurvy 	Citrus fruits, broccoli, strawberries, peppers, tomatoes, cantaloupe
Calcium	<ul style="list-style-type: none"> • Muscle contraction • Blood clotting • Nerve impulse transmission • Calcification of bone and tooth structure 	<ul style="list-style-type: none"> • Osteoporosis • Incomplete calcification of hard tissues • Toxicity: not seen 	Dairy products, tofu, fortified orange juice, and soy milk, green leafy vegetables, canned salmon and sardine bones
Phosphorus	<ul style="list-style-type: none"> • Required for bone and teeth strength • Acid-base balance • Muscle contraction 	<ul style="list-style-type: none"> • Poor bone maintenance • Incomplete calcification of teeth • Compromised alveolar integrity • Toxicity: skeletal porosity 	Dairy products, meat, poultry, processed foods, soft drinks, nuts, legumes, whole grain cereals
Magnesium	<ul style="list-style-type: none"> • Bone strength and rigidity • Hydroxyapatite crystal formation • Nerve impulse • Muscle contraction 	<ul style="list-style-type: none"> • Muscle weakness • Alveolar bone fragility • Toxicity seen in medications containing magnesium 	Wheat bran, whole grains, green leafy vegetables, legumes, nuts, chocolate
Fluoride	<ul style="list-style-type: none"> • Prevention of dental caries • Remineralization 	<ul style="list-style-type: none"> • Increased incidence of caries • Toxicity: tooth mottling; enamel hypoplasia 	Fluoridated water, tea, seaweed, toothpaste
Iron	<ul style="list-style-type: none"> • Component of hemoglobin • Carries oxygen to cells • Immune function • Cognitive development 	<ul style="list-style-type: none"> • Anemia: pallor of face, conjunctiva, lips, mucosa and gingiva • Shortness of breath • Fatigue • Decreased immunity • Toxicity: GI upset; pigmentation; seen in persons with hemochromatosis 	Meat, poultry, fish, whole grains, dried fruit, enriched grains
Zinc	<ul style="list-style-type: none"> • Required for over 100 enzymes • Normal growth and development • Taste and smell sensitivity • Sexual development and reproduction • Immune integrity • Wound healing 	<ul style="list-style-type: none"> • Altered taste • Growth retardation • Decreased wound healing • Impaired immunity • Toxicity: rare (stomach irritation; cramps; diarrhea; vomiting) 	Seafood, meats, whole grains, greens
Copper	<ul style="list-style-type: none"> • Aids in iron metabolism • Collagen formation 	<ul style="list-style-type: none"> • Anemia • Poor growth • Low WBC • Bone demineralization • Tissue fragility • Decreased trabeculae of alveolar bone • Toxicity: vomiting; diarrhea 	Whole grains, nuts, dried fruits, meats legumes, shell fish, organ

Source: Palmer CA, editor. *Diet and nutrition in oral health*. 2nd ed. Upper Saddle River: Pearson Prentice Hall; 2007. Chapter 8, Palmer, CA Papas, AS: The minerals and mineralization; Chapter 9, Palmer, CA: Vitamins today; pp. 163, 169–71, 204–5, 222–5.