

# WATER-SOLUBLE VITAMINS

VITAMIN	FUNCTION/S	DEFICIENCY/S	TOXICITY/S	SOURCES
<p><b>Folic Acid (Pteroylglutamic Acid)</b></p>	<ul style="list-style-type: none"> <li>▪ Necessary for DNA &amp; RNA synthesis</li> <li>▪ Essential for the growth and reproduction of all body cells</li> <li>▪ Works with vitamin B12 in the formation of red blood cells</li> <li>▪ Aids in amino acid metabolism</li> <li>▪ Especially important for women of childbearing age</li> </ul>	<ul style="list-style-type: none"> <li>▪ Pernicious anemia (large cell type)</li> <li>▪ Depression</li> <li>▪ Impairs growth</li> <li>▪ In pregnancy, greater risk of delivering a baby with neural tube deficits such as spinal bifida</li> <li>▪</li> </ul>	<ul style="list-style-type: none"> <li>▪ May mask symptoms of vitamin B12 deficiency</li> <li>▪ May interfere with other medications</li> <li>▪ Intestinal problems</li> </ul>	<ul style="list-style-type: none"> <li>▪ Green leafy vegetables such as turnip greens, spinach, butterhead lettuce</li> <li>▪ Kidney beans, navy beans, pinto beans, black beans, black-eyed peas, split peas, cowpeas, green peas, lima beans</li> <li>▪ Organ meats, meat, seafood, eggs, brewer's yeast, asparagus, broccoli, collards</li> <li>▪ Most enriched grain products- whole grain cereals, breads, flour, cornmeals fortified with folic acid</li> </ul>

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<p><b>Pantothenic Acid</b></p>	<ul style="list-style-type: none"> <li>▪ Helps convert proteins, carbohydrates, fats into energy</li> <li>▪ Synthesizes hormones and cholesterol</li> <li>▪ Fights infections by building antibodies</li> <li>▪ Improves the body's resistance to stress</li> </ul>	<ul style="list-style-type: none"> <li>▪ Retards growth</li> <li>▪ Infertility</li> <li>▪ Fatigue</li> <li>▪ Irritability</li> <li>▪ Skin abnormalities</li> <li>▪ Weakness</li> <li>▪ Depression</li> <li>▪ Decreased resistance to infection</li> <li>▪ Muscle cramps</li> </ul>	<ul style="list-style-type: none"> <li>▪ Occasional diarrhea</li> <li>▪ Water retention</li> </ul>	<ul style="list-style-type: none"> <li>▪ Salmon</li> <li>▪ Liver</li> <li>▪ Kidney</li> <li>▪ Egg</li> <li>▪ Yeast</li> <li>▪ Chicken</li> <li>▪ Yogurt</li> <li>▪ sweet potato</li> <li>▪ milk</li> <li>▪ ham</li> <li>▪ corn</li> <li>▪ whole-wheat macaroni</li> <li>▪ kidney beans</li> <li>▪ avocado</li> <li>▪ mushrooms</li> <li>▪ soybeans</li> <li>▪ banana</li> <li>▪ orange</li> <li>▪ collard greens</li> <li>▪ potato</li> <li>▪ broccoli</li> <li>▪ cantaloupe</li> <li>▪ peanut butter</li> <li>▪ apple</li> <li>▪ wheat germ</li> <li>▪ whole grain breads and cereals</li> </ul>

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<p><b>Thiamin (Viatmin B<sub>1</sub>)</b></p>	<ul style="list-style-type: none"> <li>▪ Helps produce energy in all cells of the body</li> <li>▪ Promotes growth &amp; good muscle tone</li> <li>▪ Stabilizes the appetite</li> <li>▪ Aids in energy (carbohydrate) metabolism</li> <li>▪ Essential for the normal functioning of the nervous system, muscles &amp; heart</li> </ul>	<ul style="list-style-type: none"> <li>▪ Poor appetite</li> <li>▪ Weakness</li> <li>▪ Nerve damage</li> <li>▪ Pins and needles in legs</li> <li>▪ Fatigue</li> <li>▪ Insomnia</li> <li>▪ Loss of weight</li> <li>▪ Vague aches &amp; pains</li> <li>▪ Beriberi, which affects the nervous and cardiovascular systems, and muscle wasting</li> <li>▪ Wernicke-Korsakoff syndrome, which results in mental confusion, amnesia and muscular incoordination</li> </ul>	<ul style="list-style-type: none"> <li>▪ The kidney excretes any excess thiamin. Extra amounts have no energy boosting effect</li> </ul>	<ul style="list-style-type: none"> <li>▪ Beef liver</li> <li>▪ Pork</li> <li>▪ organ meats</li> <li>▪ brewer's yeast</li> <li>▪ whole grain bread</li> <li>▪ cereals</li> <li>▪ enriched rice</li> <li>▪ sunflower seeds</li> <li>▪ ham steak</li> <li>▪ wheat germ</li> <li>▪ green peas</li> <li>▪ black beans</li> <li>▪ watermelon</li> <li>▪ Canadian bacon</li> <li>▪ Fish</li> <li>▪ split peas</li> <li>▪ oatmeal</li> <li>▪ black-eyed peas</li> <li>▪ oysters</li> <li>▪ milk</li> <li>▪ potatoes</li> <li>▪ whole grains and enriched cereals and breads</li> </ul>

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<p><b>Cobalomin (Vitamin B<sub>12</sub>)</b></p>	<ul style="list-style-type: none"> <li>▪ Necessary for carbohydrate, fat and protein metabolism</li> <li>▪ Helps in the formation &amp; regeneration of red blood cells</li> <li>▪ Helps maintain the central nervous system</li> <li>▪ Necessary for folate activity</li> <li>▪ Promotes growth in children</li> <li>▪ Needed for calcium absorption</li> <li>▪ Increases energy</li> </ul>	<ul style="list-style-type: none"> <li>▪ Weakness and fatigue</li> <li>▪ Poor appetite</li> <li>▪ Red-sore tongue or smooth tongue</li> <li>▪ Growth failure in children</li> <li>▪ Nerve damage</li> <li>▪ Pernicious anemia (large cell type)</li> <li>▪ Degeneration of peripheral nerves leading to paralysis</li> </ul>	<ul style="list-style-type: none"> <li>▪ No symptoms are known of Vitamin B12 toxicity</li> </ul>	<ul style="list-style-type: none"> <li>▪ Liver</li> <li>▪ Beef</li> <li>▪ Kidney</li> <li>▪ Chicken</li> <li>▪ fish such as salmon, halibut and tuna</li> <li>▪ yogurt</li> <li>▪ milk</li> <li>▪ Swiss cheese</li> <li>▪ American processed cheese</li> <li>▪ Egg</li> <li>▪ Breakfast cereals</li> <li>▪ soy milk</li> <li>▪ vegetarian burger patties that are fortified with vitamin B12</li> </ul>

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<p><b>Riboflavin (Vitamin B<sub>2</sub>)</b></p>	<ul style="list-style-type: none"> <li>▪ Necessary for carbohydrate, fat and protein metabolism</li> <li>▪ Involved with the action of other B-vitamins (folate and pyridoxine)</li> <li>▪ Essential for growth and general health</li> <li>▪ Promotes smooth skin</li> <li>▪ Necessary for the maintenance of good vision, nails &amp; hair</li> <li>▪ Aids in the formation of antibodies and red blood cells</li> </ul>	<ul style="list-style-type: none"> <li>▪ Itching and burning eyes, which become sensitive to light</li> <li>▪ Cracks and sores in the mouth &amp; lips</li> <li>▪ Bloodshot eyes</li> <li>▪ Dry and flaky skin</li> <li>▪ Retarded growth</li> <li>▪ Sore, red tongue</li> <li>▪ Skin rash</li> <li>▪ Digestive disturbances</li> <li>▪ Emotional changes, such as depression and hypochondria</li> </ul>	<ul style="list-style-type: none"> <li>▪ May interfere with anticancer medications</li> </ul>	<ul style="list-style-type: none"> <li>▪ Organ meats such as kidney and beef liver</li> <li>▪ Meat</li> <li>▪ Poultry</li> <li>▪ dark green leafy vegetables such as kale and spinach</li> <li>▪ yogurt</li> <li>▪ milk</li> <li>▪ dairy foods</li> <li>▪ egg</li> <li>▪ enriched breads and cereals</li> <li>▪ brewer's yeast</li> <li>▪ soybeans</li> <li>▪ cheese such as Swiss cheese</li> <li>▪ black-eyed peas</li> <li>▪ green peas</li> <li>▪ chick peas</li> <li>▪ kidney beans</li> <li>▪ peanuts</li> <li>▪ broccoli</li> </ul>

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<p align="center"><b>Niacin (Vitamin B<sub>3</sub>)</b></p>	<ul style="list-style-type: none"> <li>▪ Helps metabolize protein, carbohydrate and fat</li> <li>▪ Maintains the nervous system</li> <li>▪ May reduce high blood pressure</li> <li>▪ Reduces the cholesterol level in the blood</li> <li>▪ Helps maintain healthy skin, tongue &amp; digestive system</li> <li>▪ Improves circulation</li> </ul>	<ul style="list-style-type: none"> <li>▪ Pellagra, characterized by dermatitis (inflammation of the skin), diarrhea and memory loss</li> <li>▪ Weakness</li> <li>▪ Irritability</li> <li>▪ Insomnia</li> <li>▪ Headaches</li> <li>▪ Muscular weakness</li> <li>▪ Loss of appetite</li> <li>▪ Gastrointestinal disturbance</li> </ul>	<ul style="list-style-type: none"> <li>▪ Flushed skin</li> <li>▪ Rashes</li> <li>▪ Ulcers</li> <li>▪ Doses exceeding 2.5 grams/day can cause liver damage and glucose intolerance</li> </ul>	<ul style="list-style-type: none"> <li>▪ Poultry</li> <li>▪ Beef</li> <li>▪ fish such as tuna, salmon, codfish, and halibut</li> <li>▪ liver</li> <li>▪ kidney</li> <li>▪ peanuts</li> <li>▪ peanut butter</li> <li>▪ brown rice</li> <li>▪ enriched spaghetti</li> <li>▪ enriched grains</li> <li>▪ sunflower seeds</li> <li>▪ soybeans</li> <li>▪ eggs</li> <li>▪ legumes such as navy beans, lima beans, kidney beans</li> <li>▪ black-eyed peas</li> <li>▪ chick peas</li> </ul>

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<p><b>Pyridoxine (Vitamin B<sub>6</sub>)</b></p>	<ul style="list-style-type: none"> <li>▪ Aids in protein metabolism</li> <li>▪ Helps in the conversion of tryptophan (an amino acid) to niacin (vitamin B<sub>3</sub>)</li> <li>▪ Helps with normal brain function</li> <li>▪ Essential for normal growth</li> <li>▪ Helps maintain a proper balance of sodium &amp; phosphorous in the body</li> <li>▪ Aids in the formation of antibodies</li> <li>▪ Aids in the production of hormones and the formation of red blood cells</li> <li>▪ Maintains the central nervous system</li> </ul>	<ul style="list-style-type: none"> <li>▪ Anemia</li> <li>▪ Nerve dysfunction</li> <li>▪ Dermatitis (inflammation of the skin)</li> <li>▪ Nervousness</li> <li>▪ Flaky or greasy skin</li> <li>▪ Fatigue</li> <li>▪ Insomnia</li> <li>▪ Arm &amp; leg cramps</li> <li>▪ Dermatitis</li> <li>▪ Irritability or depression</li> <li>▪ Mental convulsions among infants</li> <li>▪ Loss of hair</li> <li>▪ Loss of muscular control</li> </ul>	<ul style="list-style-type: none"> <li>▪ Nerve damage</li> </ul>	<ul style="list-style-type: none"> <li>▪ Chicken</li> <li>▪ organ meats</li> <li>▪ meat</li> <li>▪ pork</li> <li>▪ peanut butter</li> <li>▪ black beans</li> <li>▪ almonds</li> <li>▪ whole grain and enriched breads and cereals</li> <li>▪ oatmeal</li> <li>▪ potatoes</li> <li>▪ bananas</li> <li>▪ watermelon</li> <li>▪ soybeans</li> <li>▪ brewer's yeast</li> <li>▪ sunflower seeds</li> <li>▪ fish such as tuna, salmon and pacific halibut</li> <li>▪ legumes such as navy beans</li> <li>▪ green peas</li> <li>▪ wheat germ</li> <li>▪ brown rice</li> <li>▪ spinach</li> <li>▪ egg yolk</li> </ul>

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<p><b>Ascorbic Acid (Vitamin C)</b></p>	<ul style="list-style-type: none"> <li>▪ Essential for healthy teeth, gums, skin, blood and bones</li> <li>▪ Helps heal wounds, scar tissue, and fractures</li> <li>▪ Aids in the absorption of iron from plant sources of food</li> <li>▪ Builds resistance to infection, maintains white blood cell function</li> <li>▪ Aids in the formation of collagen</li> <li>▪ Provides antioxidant protection. It prevents the conversion of nitrates (from tobacco smoke, smog, bacon, luncheon meats, and some vegetables) into cancer-causing substances.</li> <li>▪ Aids in the treatment of the common cold</li> </ul>	<ul style="list-style-type: none"> <li>▪ Scurvy a disease that causes excessive bleeding, loose teeth, and swollen gums</li> <li>▪ Slow healing wounds and fractures</li> <li>▪ Swollen or painful joints</li> <li>▪ Bruising and petechiae (spots of blood under the skin's surface)</li> <li>▪ Nosebleeds</li> <li>▪ Impaired digestion</li> <li>▪ Loss of appetite</li> <li>▪ Aching joints</li> </ul>	<ul style="list-style-type: none"> <li>▪ Diarrhea</li> <li>▪ May cause kidney stones</li> <li>▪ Impaired immune function</li> <li>▪ Withdrawal symptoms</li> </ul>	<ul style="list-style-type: none"> <li>▪ Guava</li> <li>▪ red bell pepper</li> <li>▪ papaya</li> <li>▪ orange juice</li> <li>▪ orange</li> <li>▪ pineapple</li> <li>▪ broccoli</li> <li>▪ green bell pepper</li> <li>▪ kohlrabi</li> <li>▪ strawberries</li> <li>▪ grapefruit</li> <li>▪ cantaloupe</li> <li>▪ tomato juice</li> <li>▪ mango</li> <li>▪ tangerine</li> <li>▪ potato</li> <li>▪ raw cabbage</li> <li>▪ tomato</li> <li>▪ collard greens</li> <li>▪ spinach</li> <li>▪ Brussels sprouts</li> <li>▪ turnip greens</li> <li>▪ cauliflower</li> <li>▪ blackberries</li> <li>▪ blueberries</li> <li>▪ acerola (West Indian cherry-like fruit)</li> </ul>