

FOOD PHOSPHATES - NUTRITIONAL ASPECTS

The Food and Nutrition Board of the National Academies has published Dietary Reference Intakes (DRIs) for calcium, phosphorus, magnesium, vitamin D, and fluoride. Dietary Reference Intake is a generic term for a set of nutrient reference values that includes Estimated Average Requirement (EAR), Recommended Dietary Allowance (RDA), Adequate Intake (AI), and Tolerable Upper Intake Level (UL). RDAs have been used in the past to establish the minimal amounts of nutrients needed to be protective against possible nutrient deficiency. DRIs are designed to reflect the latest understanding about nutrient requirements based on optimizing health in individuals and groups and can be used for planning and assessing diets for healthy populations and other purposes. (*Dietary Reference Intakes [“Daily Reference Intakes”] for Calcium, Phosphorus, Magnesium, Vitamin D and Fluoride*. Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Food and Nutrition Board, Institute of Medicine, 1997).

Phosphorus is classified as a mineral nutrient. Approximately 85% of the human body’s phosphorus content is found in the bone and teeth. Energy production and storage in the body depend upon phosphorylated compounds such as adenosine tri-phosphate (ATP). Other phosphorus compounds impact genetic information as well as the functioning of various enzymes and hormones. Phosphate compounds are also important body buffers for controlling acid-base balance (pH).

The Dietary Reference Intake (DRI) for phosphorus for men and women 19 years of age and older, including pregnant and lactating women, is 700 mg/day. For further, more specific guidance for infants and adolescents, please refer to *Daily Reference Intakes*.

Calcium, magnesium, and potassium also are essential minerals. Phosphate salts (i.e., calcium, magnesium and potassium phosphates) therefore act as dual purpose compounds and have been used in fortified beverages, dairy products, cereals and numerous food products. Typical levels of phosphorus found in foods commonly manufactured with phosphate food ingredients or phosphoric acid are listed in below.

Food	Amount	Phosphorus (milligrams)*
Pancakes	3 pancakes	430
Cinnamon Rolls	2 rolls	234
American Cheese	1 oz	211
Self-Rising Flour	100 g	480
White Cake from Mix	1 slice (1/12th of cake)	170
Cola	12 oz	63

The adult body contains approximately 1200 grams of calcium, 99% is in the skeleton and bones. Bone constantly resorbs and calcium is lost via feces, urine and sweat. Calcium must be replaced by proper diet and in many cases by use of calcium phosphate supplements. Failure to maintain adequate mineral levels can result in osteoporosis and other bone diseases, especially in post-menopausal women. More detailed discussions are available in *Daily Reference Intakes* and in nutritional literature. “Calcium Effects on Phosphorus Absorption: Implications for the Prevention and Co-Therapy of Osteoporosis,” by Robert P. Heaney (Journal of the American College of Nutrition, Vol. 21, No. 3, 239-244, 2002) discusses the effectiveness of calcium phosphate in the treatment of osteoporosis.

The adult human body contains 20 to 28 grams of magnesium, 40% is in the muscles and soft body tissues, about 1% is in the extracellular fluids and the remainder is in the skeleton. Magnesium activates numerous enzymes and impacts biochemical and physiological processes. Magnesium phosphate can be used to provide a source of magnesium in the diet.

Potassium is present in cell water at a concentration of 145 milliequivalents/l and in the plasma and interstitial fluid at 3.8 to 5 milliequivalents/l. At this low level, potassium has critical physiological effects on the transmission of nerve impulses, control of skeletal muscle contractions and maintenance of normal blood pressure. In October 2000, the US Food and Drug Administration (FDA) approved the use of a "heart healthy claim" for products that meet the nutritional criteria as outlined in the FDA's "Health Claim Notification for Potassium Containing Foods," 2000. To be heart healthy a product must contain:

- 350 mg of potassium per serving
- Less than 140 mg of sodium per serving
- Less than 3 gm of fat, 1 gm of saturated fat and 20 mg of cholesterol

Monopotassium phosphate, dipotassium phosphate, tripotassium phosphate and tetrapotassium pyrophosphate can provide a source of potassium for heart healthy foods.