

Supplement Handout: Vitamin D

Vitamin D is a fat-soluble vitamin that is naturally present in some foods, fortified in others, and available as a dietary supplement. Common vitamin D-containing foods include mushrooms; fortified milk, juices and cereals; fish, such as mackerel, salmon, herring, tuna and sardines; beef liver and eggs. Vitamin D is produced by the body when UV rays from sunlight hit the skin and trigger vitamin D synthesis. Vitamin D must undergo two hydroxylations in the body in order to be converted to its active form. The first reaction takes place in the liver and converts vitamin D to 25-hydroxyvitamin D [25(OH)D] or calcidiol. The second reaction occurs primarily in the kidneys, forming the physiologically active 1, 25-dihydroxyvitamin D [$1,25(\text{OH})_2\text{D}$], also known as calcitriol.

Functions of Vitamin D

Vitamin D serves a wide range of functions in the body, including regulating calcium and phosphate absorption and maintaining adequate serum calcium levels; facilitating bone growth and remodeling; modulation of cell growth, neuromuscular and immune function; regulation of hormone production; and more.

Recommended Daily Intake

The amount of vitamin D required depends on an individual's age and life stage. In 2010, the IOM recommended an increase in the RDI for vitamin D, which increased intake recommendations for every age group. This recommendation reflected recent research into the prevalence of deficiency, as well as emerging physiological functions and health benefits of vitamin D in the areas of reductions in hypertension and prevention of influenza, chronic disease, autoimmune disease, and some cancers.

Life Stage	Recommended Amount
Birth to 12 months	400 IU
Children 1-13 years	600 IU
Teens 14-18 years	600 IU
Adults 19-70 years	600 IU
Adults ages 71+	800 IU
Pregnant & breastfeeding women	600 IU

Assessing Sufficiency and Deficiency

Serum concentration of 25(OH)D is the best indicator of vitamin D status, however these levels do not indicate the amount of vitamin D stored in body tissues. Most individuals are at sufficient levels with serum 25(OH)D concentrations of 50 nmol/L or more, however there is a risk of deficiency at concentrations <30 nmol/L, and some individuals may be at risk for inadequacy at levels ranging from 30-50 nmol/L.

Deficiency or complications from deficiency can be common in individuals living in northern latitudes, where sun exposure is minimal; individuals who wear sunscreen during all outdoor time; individuals with dark skin; individuals with fat-malabsorption issues; older individuals; post-menopausal women and infants. These populations should be monitored closely for appropriate vitamin D status, especially individuals at previous or current risk for osteomalacia or osteoporosis. The most common deficiency-related disease is rickets, a disease characterized by a failure of bone tissue to properly mineralize, resulting in soft bones and skeletal deformities. This can be especially damaging for young children, during the early stages of bone development and skeletal growth.

Increasing Intake / Supplementation

There is a relatively low risk of toxicity in relation to vitamin D supplementation (UL 4,000 IU/day), while the rates of vitamin D inadequacy or deficiency have been steadily increasing (36-57% in adults). Despite the increased RDI, many public health officials and researchers are calling for additional increases in intake; up to 1,000-2,000 IU/day in many cases. These increases can reduce risk of deficiency, while increasing the potential for newly-discovered health benefits of vitamin D (see above). Increased consumption of vitamin D-containing foods can be an important way to augment intake, and daily supplementation of 1000 IU of vitamin D₂ or D₃ for teens and/or adults can also be beneficial. Most breast-fed infants will also require vitamin D supplementation, usually in the form of drops, of 200 IU/daily.

Citations/References

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