

# Nutritional Aspects of Vitamin D

## Introduction

A "vitamin" by definition is a substance regularly required by the body in small amounts but which the body cannot make and is, therefore, required to be supplied in the daily diet. Technically the molecular species classified as vitamin D is not really a vitamin because it can be produced by exposure of the skin to sunlight. However, for nutritional and public health reasons, vitamin D<sub>3</sub> continues to be classified officially as a vitamin.

## Nutritional Aspects

The World Health Organization has responsibility for defining the "International Unit" of vitamin D<sub>3</sub>. Their most recent definition, provided in 1950 states that "the International Unit of vitamin D recommended for adoption is the vitamin D activity of 0.025 micrograms of the international standard preparation of crystalline vitamin D<sub>3</sub>". Thus, 1.0 IU of vitamin D<sub>3</sub> is 0.025 micrograms, which is equivalent to 65.0 pmoles. With the discovery of the metabolism of vitamin D<sub>3</sub> to other active seco-steroids, particularly 1,25(OH)<sub>2</sub>D<sub>3</sub>, it was recommended that 1.0 unit of 1,25(OH)<sub>2</sub>D<sub>3</sub> be set equivalent in molar terms to that of the parent vitamin D<sub>3</sub>. Thus, 1.0 unit of 1,25(OH)<sub>2</sub>D<sub>3</sub> has been operationally defined to be equivalent to 65 pmoles.

The vitamin D requirement for healthy adults has never been precisely defined. Since vitamin D<sub>3</sub> is produced in the skin after exposure to sunlight, the human does not have a requirement for vitamin D when sufficient sunlight is available. However, vitamin D does become an important nutritional factor in the absence of sunlight. It is known that a substantial proportion of the U.S. population is exposed to quite suboptimal levels of sunlight especially during the winter

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months; it is likely that during these intervals that a regular dietary supply of vitamin D<sub>3</sub> should be provided. In addition to geographical and seasonal factors, ultraviolet light from the sun may also be blocked by air pollution. The tendency to wear clothes, to live in cities where tall buildings block adequate sunlight from reaching the ground, to live indoors, to use synthetic sunscreens that block ultraviolet rays, and to live in geographical regions of the world that do not receive adequate sunlight, all contribute to the inability of the skin to biosynthesize sufficient amounts of vitamin D<sub>3</sub>. Under these conditions vitamin D becomes a true vitamin in that it must be supplied in the diet on a regular basis.

Since vitamin D<sub>3</sub> can be endogenously produced by the body and since it is retained for long periods of time by vertebrate tissue, it is difficult to determine with precision the minimum daily requirements for this seco-steroid. The requirement for vitamin D is also known to be dependent on the concentration of calcium and phosphorus in the diet, the physiological stage of development, age, sex, degree of exposure to the sun, and the amount of pigmentation in the skin.

The current Recommended Dietary Allowance (RDA) of vitamin D in 1989 by the Food and Nutrition Board of the Commission on Life Sciences of the National Research Council is 200 IU/day (5 micrograms/day) up to the age of 50. The recommended intake for people from age 51 to 70 is 400 IU/day (10 micrograms), and over age 70 is 600 IU/day (15 micrograms). The RDA of vitamin D for both pregnant and lactating women is recommended to be 200 IU (5 micrograms/day).

In the United States, adequate amounts of vitamin D can readily be obtained from the diet and from casual exposure to sunlight. However, in some parts of the world where food is not routinely fortified and sunlight is often limited during some periods of the year, obtaining adequate amounts of vitamin D becomes more of a problem. As a result, the incidence of rickets in these countries is higher than in the United States.

## Food Sources

Animal products constitute the bulk source of vitamin D that occurs naturally in unfortified foods. Salt water fish such as herring, salmon, sardines, and fish liver oils are good sources of vitamin D<sub>3</sub>. Small quantities of vitamin D<sub>3</sub> are also derived from eggs, veal, beef, butter, and vegetable oils while plants, fruits, and nuts are extremely poor sources of vitamin D. In the United States, artificial fortification of foods such as milk (both fresh and evaporated), margarine and butter, cereals, and chocolate mixes help in meeting the RDA recommendations.

## References:

- Utiger, R.D. The need for more vitamin D. *N. Engl. J. Med.* **228**:828-829 (1998).
- Holick, M.F. Vitamin D and bone health. *J. Nutr.* **126 Suppl.** 159S-1164S (1996).
- Collins, E.D. and Norman, A.W. Vitamin D. In: *Handbook of vitamins*, edited by Machlin, L.J. New York: Marcel Dekker, pp. 59-98 (1990).
- Subcommittee on the Tenth Edition of the RDAs, Food & Nutrition Board, Commission on Life Sciences and National Research Council. *Recommended dietary allowances*, Washington, D.C.: National Academy Press. Ed. 10th pp. 1-285 (1989).