

FOCUS ON VITAMIN D

by Dr Bevan Hokin

INTRODUCTION

Rickets was a common condition that all but disappeared once foods were fortified with vitamin D. Rickets is only the 'tip of the vitamin D-deficiency iceberg', with vitamin D deficiency remaining common in children and adults. In utero, vitamin D deficiency can cause growth retardation and skeletal deformity and increase the risk of hip fracture in later life. In adults, deficiency can precipitate or exacerbate osteopænia and osteoporosis, cause osteomalacia and muscle weakness. Of great interest is the role vitamin D can play in decreasing the risk of many chronic illnesses, including common cancers, autoimmune diseases and cardiovascular disease.

METABOLISM OF VITAMIN D

Vitamin D occurs in two forms, cholecalciferol, or vitamin D3, and the plant-derived ergocalciferol, or vitamin D2. These two forms are biologically equivalent in human beings. For most ambulatory people, the majority of the vitamin D in the body is derived from the action of ultraviolet B light on 7-dehydrocholesterol in the skin, converting it to previtamin D3, which, at body temperature, thermally isomerises into vitamin D3. A smaller proportion of vitamin D comes from dietary sources. Vitamin D made in the skin or ingested in the diet is biologically inert and must undergo conversion to 25-hydroxyvitamin D3 (25-OHD) in the liver and then in the kidney to 1,25-dihydroxyvitamin D3 (calcitriol).

NEED FOR VITAMIN D

The recommended daily intake (RDI) of vitamin D is 200 IU for children and adults up to age 50 years; 400 IU for adults 51-70 years; and 600 IU for adults 71 years and older. Without adequate sun exposure, the requirement increases to 800-1000 IU per day for all ages.

SOURCES OF VITAMIN D

Unlike the United States, few foods in Australia are fortified with vitamin D.

Humans get vitamin D from exposure to sunlight, some foods (oily fish, fresh whole milk, butter and margarine (Vitamin D is fat soluble)) and supplements. Table 1

PREVALENCE OF VITAMIN D DEFICIENCY IN AUSTRALIA

Several studies have assessed vitamin D status in Australia and New Zealand. The prevalence of deficiency varies, but is acknowledged to be much higher than previously thought. Deficiency is classified as either marginal (25-OHD levels <50 nmol/L) or frank (25-OHD levels, < 25 nmol/L). The highest rates of frank deficiency occur in dark-skinned, veiled, pregnant women (80%), with similarly high rates found in mothers of infants treated for rickets. Another high-risk group is the elderly, with marginal deficiency rates of 76% in nursing home residents, and 53% in hostel residents. Other studies assessing younger adults have reported marginal deficiency rates of 23% and 43%, with 8% of young women (20-39 years) found to have frank deficiency at the end of winter in Geelong (Victoria, latitude 38°S).

Table 1. Sources of Vitamin D

SOURCES OF VITAMIN D	VITAMIN D CONTENT
Salmon tinned (100 gm)	300-600 IU of vitamin D3
Cod liver oil (1 tsp)	400-1000 IU of vitamin D3
Egg yolk (one)	20 IU vitamin D2 or D3
Fresh whole milk (1 glass 250 mL)	100 IU
Butter (100gm)	50 IU
Margarine per 10 gm	Between 22 and 64 IU
Fortified skim or modified milk (200mL)	400 IU
Fortified Cheese (25 gm)	400 IU
Sun exposure (depending on time of day, season, latitude and skin type). 10 minutes exposure by direct sunlight to the exposed arms and legs	Up to 3000 IU

TREATMENT OF VITAMIN D DEFICIENCY

Children with vitamin D deficiency should be aggressively treated to prevent rickets. A cost-effective method of correcting vitamin D deficiency in children and adults, and maintaining adequate levels is to give patients either 1000 IU of vitamin D3 per day or 3000 IU of vitamin D2 per day. (Holick 2007)

SAMPLE TYPES

Suitable sample types are serum (plain tube) or Li-heparin (green top tube) or EDTA plasma (mauve top tube).

VITAMIN D REFERENCE RANGES

Ideal for general health: > 75 nmol/L
 Minimum for bone health: 50 - 80 nmol/L
 Marginally deficient: 25- 50 nmol/L
 Frank deficiency: <25 nmol/L

CONCLUSIONS

Undiagnosed vitamin D deficiency is common, and 25-hydroxyvitamin D is the barometer for vitamin D status. Serum 25-hydroxyvitamin D is not only a predictor of bone health but is also an independent predictor of risk for cancer and other chronic diseases. Much evidence suggests that the recommended adequate intakes are actually inadequate and need to be increased to at least 800 IU of vitamin D3 per day. It is very difficult to obtain that much vitamin D3 on a daily basis from dietary sources alone. Thus, sensible sun exposure (10 min/day on arms and legs) and the use of supplements are needed to meet the body's vitamin D requirement.

SAH Pathology offers vitamin D testing (25-hydroxyvitamin D). There is an item number for the test.



DR BEVAN HOKIN

BSc MAppSc PhD
 DIRECTOR OF THE PATHOLOGY
 LABORATORIES AT SYDNEY
 ADVENTIST HOSPITAL

Dr Hokin can be contacted on
 9487 9511

References. This update is based primarily on the following papers:
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