

Use

Irrespective of weight, babies need 10 micrograms of vitamin D (400 IU) a day for optimal bone growth. While all artificial milks provide this, breast milk will not do this if the mother, herself, is sub-clinically deficient.

Pharmacology

Vitamin D is the generic term used to describe a range of compounds that control calcium and phosphate absorption from the intestine, their mobilisation from bone, and also possibly their retention by the kidneys. Vitamin D₂ (calciferol or ergocalciferol) and vitamin D₃ (cholecalciferol) are the main dietary sources of vitamin D. However, these have to be hydroxylated to 25-hydroxyvitamin D by the liver and further hydroxylated to 1,25-dihydroxyvitamin D by the kidney and placenta before becoming metabolically active. The vitamin's existence was first unequivocally established in 1925.

Nutritional factors

Most breakfast cereals and spreading margarines provide dietary vitamin D. So do oily fish (cod liver oil was once a popular source). Exposure to ultraviolet summer sunlight is, however, the main reason why most people avoid becoming vitamin D deficient, and clothing can block this as can the excessive use of sunblock cream! Maternal deficiency severe enough to cause congenital rickets or craniotabes is rare, but many women have sub-optimal levels rendering their children, if breast fed, vulnerable to the hazards of overt rickets. There is also increasing evidence that sub-clinical deficiency during pregnancy and the first year of life can have a permanently damaging impact on bone growth in later childhood (see web commentary).

The amount of vitamin D required in infancy is influenced by the adequacy of the stores built up during fetal life, and by subsequent exposure to sunlight. If neither can be guaranteed the case for a regular dietary is overwhelming, and there is no good reason not to start this at birth. Many weaning foods are fortified while all formula milks (q.v.) contain at least 1 microgram/100 ml but, because breast milk usually contains less than 1 microgram/l even in women with good nutritional reserves, many breast fed babies continue to become covertly deficient if they are not supplemented, especially in winter. Babies with severe renal disease unable to make the active metabolite for themselves, and babies with congenital hypoparathyroidism or pseudohypoparathyroidism, are the *only* children needing either alfacalcidol (1 α -hydroxycholecalciferol) or calcitriol (1,25-dihydroxycholecalciferol) as outlined in a separate monograph.

It is, however, important to remember that while vitamin D deficiency causes rickets, a total daily intake of more than 100 micrograms can cause hazardous hypercalcaemia. Excessive maternal supplementation during lactation is, therefore, a theoretical hazard.

Maternal prophylaxis

The optimum strategy is to get all women to take a 10 microgram supplement daily throughout pregnancy, and, in the UK, the 'Healthy Start' women's vitamin tablets now make this possible. An alternative strategy, adopted in some parts of Europe, is to give all women suspected of having vitamin D stores (including all veiled women) a 2.5 mg IM injection of vitamin D early in the third trimester of pregnancy.

Prophylaxis after birth

Breast fed babies: Give 7.5 micrograms regularly once a day until mixed feeding is established.

Preterm babies: Give all preterm babies 7.5 micrograms once a day until they weigh at least 3 Kg.

Malabsorption: Give babies with complete biliary obstruction 750 micrograms IM once a month.

Renal disease: Give *alfacalcidol* instead by mouth or IV to babies unable to hydroxylate vitamin D₂ (ergocalciferol), as outlined in the monograph in this formulary on special formulations of vitamin D.

Supply

Prophylaxis during pregnancy: 'Healthy Start' women's vitamin tablets, costing 1–2p each and containing 10 micrograms of vitamin D₃, 70 mg of vitamin C and 400 micrograms of folic acid (but no vitamin A), became available in the UK to all women who are pregnant or breast feeding in March 2007. For details, and for more general advice on diet during pregnancy and infancy, see: www.healthystart.nhs.uk

Prophylaxis during the first year of life: See the multivitamin monograph for various alternatives.

Treatment of established vitamin deficiency: 1 ml (7.5 mg, 300,000 unit) ampoules of ergocalciferol (D₂) for IM use cost £5.90. 10 microgram (400 unit) tablets, containing redundant calcium, cost 3p each. A 3000 unit/ml oral liquid is available from Martindale; 100 ml costs £37.

References

See also the relevant Cochrane reviews ©

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