

Vitamin D Boosting Season **What, where and how to best advise your patients**

Dr Carrie Ruxton

Vitamin D deficiency, long forgotten in the UK, is resurfacing as a key concern especially amongst those with a reduced intake of food rich in vitamin D and reduced sun exposure. Dr Carrie Ruxton, Freelance Dietitian presents an overview of the research surrounding vitamin D with practical advice for patients.

War time rationing and post-war affluence had banished rickets to the history books resulting in vitamin D being somewhat forgotten by health professionals. It was assumed that everyone got plenty of sun so the UK government made vitamin D recommendations for those considered at risk. However, this situation has changed bringing vitamin D into the spotlight. The reasons are multiple;

- Few foods are naturally rich or fortified with vitamin D
- Reduced sun exposure due to skin cancer messages
- Changes to the ethnic make-up of the British population with increased numbers of women and girls covering their skin for religious or cultural reasons
- Growing scientific evidence showing greater amounts of vitamin D may be required for optimal health.

The sunshine vitamin

Vitamin D is a hormone made by our bodies in response to the action of sunlight on the skin. However, when sun exposure is limited, e.g. in wintertime, in housebound individuals, or because the skin is covered up for cultural reasons, an adequate dietary supply becomes essential (Scientific Advisory Committee on Nutrition [SACN], 2007). Only sunlight within a specific UVB spectrum (290-315nm) can stimulate vitamin D production in our bodies. This is an important point because in Northern areas, the sunlight is of the wrong spectrum for vitamin D production for several months of the year. Thus, it is especially important for people living in the North of England, Scotland and Northern Ireland to have sufficient sun exposure during the summer.

Dietary sources

Vitamin D can also be consumed directly from the diet, although this constitutes only a small proportion of vitamin D stores. In the diet, vitamin D is available in two forms;

- D₂ (ergocalciferol) found in plant foods
- D₃ (cholecalciferol) found in animal foods.

It was previously believed that D₃ was better absorbed than D₂ but this has recently been disproved (Holick et al, 2008).

Few foods in the UK provide vitamin D and figures from the latest Family Food Survey suggest that intakes of key vitamin D-rich foods are in decline (DEFRA, 2008).

Vitamin D Boosting Season

What, where and how to best advise your patients

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Key dietary sources of vitamin D

McCance & Widdowson's The Composition of Food

- Oily fish (salmon, mackerel, trout, herring, tuna) – exceptionally high in vitamin D3
- Offal and some red meat
- Fortified margarines
- A handful of fortified breakfast cereals
- Fortified dairy products – dairy products in the UK unlike the US are not fortified with vitamin D.
- Eggs
- Fortified soya dairy alternatives e.g. milk, yogurts, desserts

Vitamin D & Bone Health

Vitamin D is essential for normal bone health. There is now fairly consistent evidence showing that sufficient vitamin D and calcium can improve bone mineral density and reduce the risk of osteoporosis, especially in older women. Osteoporosis affects one in three women and one in 12 men (Langham-New, 2008). Vitamin D may also reduce the risk of falls as it has a beneficial impact on neuromuscular coordination and muscle function.

Vitamin D and Heart Health

There is some evidence that a poor vitamin D status influences cardiovascular disease (CVD) risk, perhaps through stimulation of hypertension or increased risk of insulin resistance and inflammation. Martins *et al.* (2007) looked at associations between vitamin D status and CVD using data from a survey of 15,000 adults. The risk of hypertension, raised serum triglyceride levels and diabetes was greater in those with the lowest vitamin D status. Another study of more than 18,000 men found an increased risk of heart attack when vitamin D status was low. A controlled trial of vitamin D supplementation in diabetic patients found reduced blood pressure and better vascular function (Sugden *et al.*, 2008).

Vitamin D & other Chronic Diseases

In a meta-analysis of controlled trials of vitamin D supplementation, overall mortality was 7% higher in those with a poor vitamin D status (Autier & Gandini, 2008). Other studies have associated low levels of vitamin D with an increased risk of chronic diseases. One study of 1179 women aged >55 years reported that women taking 25µg vitamin D daily had a lower overall **cancer** incidence after 4 years (Lappe *et al.*, 2007). It has been suggested that increasing average dietary intakes to 25µg/d could lower cancer risk in older women (Schumann & Ewigman, 2007).

Finally, there may a link between poor vitamin D status and increased risk of **diabetes**, **multiple sclerosis**, and **rheumatoid arthritis** (Ruxton & Derbyshire, 2009). Scientists believe that vitamin D may be important for

Vitamin D Boosting Season

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maintaining normal **immune function** and **glucose control**. Research into these associations is still in the early stages and more evidence is needed.

Recommendations

UK Dietary Reference Values (DRV) for vitamin D are targeted only at children and groups of adults considered 'at risk' (Department of Health, 1991). The majority of adults are expected to synthesise enough vitamin D via regular sun exposure.

Table 1: UK Dietary Reference Values (DRV) for vitamin D

Age group	DRV (micrograms/day)
0 to 6 months	8.5
7 to 12 months	7.0
1 to 3 years	7.0
Men and women aged 50 years plus	10.0
Pregnancy and lactation	10.0

Other countries, including the US, make recommendations across the age spectrum, ranging from 5 to 15 micrograms. In the US, the Institute of Medicine (Institute of Medicine, 2009) is leading on the re-examination of these in view of the growing body of evidence linking vitamin D with health benefits. In the UK, although SACN produced a report on vitamin D noting associations between a poor vitamin D status and chronic disease risk, it stopped short of recommending a review of dietary recommendations.

Intake vs. Status

Intake: How much was consumed and whether there may be a risk of deficiency.

Table 2: Average vitamin D intakes in the UK

(National Diet and Nutrition Survey (Bates et al, 2010))

Age group (years)	Intakes (micrograms per day)	
	Male	Female
4-10	1.9	2.0
11-18	2.5	2.1
19-64	3.1	2.7

Lack of DRV's for these age groups, mean it is not possible to assess who is meeting UK recommendations. However, through comparing intakes against the European labelling recommendation of 5 micrograms per day, average intakes provide only 38 to 62% of the recommended amount of vitamin D, which is too low. Additionally the previous NDNS (Henderson *et al.*, 2003) reported slightly higher intakes of vitamin D, suggesting that vitamin D intake is declining in the UK.

Vitamin D Boosting Season

What, where and how to best advise your patients

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Status: A more accurate picture of the risk of deficiency taking into account *actual* requirements and bioavailability of dietary vitamin D.

Table 3: Average vitamin D status in the UK and Ireland

Country	Age (years)	Average 25(OH)D (nmol/l) (M-male, F-female)	Reference
UK NDNS	19-64	48.3 (M) 49.6 (F)	Ruston et al. (2004)
UK low income NDNS	19+	45.1(M) 47.2 (F)	Nelson et al. (2007)
Scotland	49 ±2.4	23.7 (F, autumn) 19.7 (F, spring)	Macdonald et al. (2008)
Ireland	12-15	64.3 (M&F)	Hill et al. (2008)

Turning to vitamin D status, several surveys have assessed blood levels of the marker, 25-hydroxy-vitamin D (25(OH)D) (see Table 3). There is no consensus, as yet, about the optimal level of 25(OH)D for health in different age groups. SACN determined that 25(OH)D should be above 25nmol/l to preserve bone health, but higher levels of >75nmol/l has been recommended by others (e.g. Holick & Chen, 2008). Achieving these levels would require vitamin D intakes of >25µg per day in addition to sun exposure, not an easy task given the limited number of foods rich in vitamin D.

Advice for Patients

- Given cancer prevention advice on limiting sun exposure and using high factor sun creams, patient advice to promote vitamin D status needs to be handled sensitively. Only 20 minutes in the sun between the hours of 10am and 2pm is required in order to make sufficient vitamin D in the body, although darker skinned people may need more than this.
- Foods rich in vitamin D are important all year round, but especially in the winter months. Eat oily fish at least once a week. Eggs, fortified dairy foods, fortified soya products, margarine and fortified breakfast cereals are also good sources.
- Those at risk of vitamin D insufficiency - elderly housebound people, young children, people with darker skins, people who cover the skin and pregnant and lactating women should be advised to take a daily supplement of 5-10µg.
- Sun exposure is a very effective way of building up vitamin D stores in the summer. However, it is advisable to check with www.sunsmart.org.uk for the best advice for safe sun exposure.

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Vitamin D Boosting Season

What, where and how to best advise your patients

Dr Carrie Ruxton

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