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## **Vitamin-D deficiency: Evidence, safety, and recommendations for the Swiss population**

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# Vitamin D deficiency: Evidence, safety and recommendations for the Swiss population

## *Swiss recommendations on vitamin D intake*

On the basis of an assessment of available data on 25-hydroxyvitamin D (25(OH)D) concentrations in the Swiss population and in neighbouring countries, the panel concludes that about 50% of the Swiss population have serum 25(OH)D concentrations below 50 nmol/L, and less than 30% have 25(OH)D concentrations above 75 nmol/L.

Current evidence supports the notion that 25(OH)D concentrations of at least 50 nmol/L are necessary to support bone health in all adults and muscle health in older adults. As regards bone and muscle health in children and adolescents, as well as other non-skeletal effects of vitamin D in all age groups, more data are needed. In adults up to 59 years of age, a vitamin D intake of 600 IU is recommended, but for the older adult population ( $\geq 60$  years) the panel strongly recommends a vitamin D supplementation of 800 IU per day, on the basis of evidence from randomized controlled trials (RCTs) showing a reduction of about 20% in the risk of falls and fractures. This recommendation is consistent with those of the Institute of Medicine (IOM, 2010), the International Osteoporosis Foundation (IOF, 2010) and the US Endocrine Society (2011).

Further, the panel concludes that, given the lack of evidence from large clinical trials, health benefits with serum concentrations higher than 50 nmol/L cannot at present be substantiated for endpoints other than bone health in all adults and muscle health in older adults. However, the panel recommends that vitamin D deficiency (i.e. 25(OH)D concentrations  $< 50$  nmol/L) should be corrected in all age groups, as this measure has greater benefits than risks. On the basis of evidence from two meta-analyses of double-blind RCTs in elderly populations, the panel recommends a 25(OH)D threshold of 75 nmol/L for optimal fall and fracture prevention, in agreement with the IOF and the US Endocrine Society.

The panel only recommends screening for vitamin D deficiency, using a high-quality assay, in individuals at high risk for severe vitamin D deficiency, in order to detect a potential need for larger vitamin D doses.

Regarding sources of vitamin D, the panel notes that due to limited sun exposure, widespread use of sun protection, seasonality and very limited nutritional sources, many individuals – particularly those with insufficient sun exposure and most older adults – need vitamin D supplements in the form of drops or tablets, regardless of season, to meet their vitamin D requirements for bone and muscle health.

### **Further information:**

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**Table 1: Overview of daily intakes of vitamin D recommended by the panel**

Group of subjects	General Swiss population	Patients with severe vitamin D deficiency (25(OH)D concentrations of < 25 nmol/L)	Both groups
	Recommended intake per day	Recommended intake per day	Safe upper intake
<b>Children / Adolescents</b>			
0-6 months	400 IU (10 µg)	400 - 1000 IU (10 – 25 µg)	1000 IU (25 µg)
6-12 months	400 IU (10 µg)	400 - 1000 IU (10 – 25 µg)	1500 IU (37.5 µg)
1-3 yrs	600 IU (15 µg)	600 - 1000 IU (15 – 25 µg)	2500 IU (62.5 µg)
4-8 yrs	600 IU (15 µg)	600 - 1000 IU (15 – 25 µg)	3000 IU (75 µg)
9-18 yrs	600 IU (15 µg)	600 - 1000 IU (15 – 25 µg)	4000 IU (100 µg)
<b>Adults</b>			
19-59 yrs	600 IU (15 µg)	1500 - 2000 IU (37.5 – 50 µg)	4000 IU (100 µg)
60+ yrs	800 IU (20 µg)	1500 – 2000 IU (37.5 – 50 µg)	4000 IU (100 µg)
<b>Pregnant / breastfeeding women</b>			
	600 IU (15 µg)	1500 – 2000 IU (37.5 – 50 µg)	4000 IU (100 µg)

As regards the recommended intake **for the general population**, the panel largely supports the 2010 recommendations of the Institute of Medicine (IOM) [1] with the aim to reduce vitamin D deficiency in all subgroups of the population. However, the panel recommends a daily vitamin D intake of 800 IU starting at age 60 – rather than 70, as suggested by the IOM – to reflect the data from RCTs on fracture and fall prevention [2], and in agreement with the 2010 IOF recommendations [3]. In addition, the panel points out that European recommendations on vitamin D intakes for children are currently being revised. Thus, the panel's recommendations for children and adolescents may be adapted in the future to conform to European standards.

Intake represents the sum of all nutritional sources of vitamin D (diet and supplements), assuming limited sun exposure (i.e. in institutionalized individuals, during the winter season in Switzerland and throughout Europe, under sun protection).

The goal of our recommendations for the general population is to ensure that 25(OH)D concentrations of at least 50 nmol/L are attained in most individuals, so as to improve bone health. With a daily vitamin D intake of 400-600 IU in children and adolescents, and 600-800 IU in adults, more than 97% of individuals will reach a threshold of 50 nmol/L, including pregnant and breastfeeding women, and about 50% will reach a concentration of 75 nmol/L. It is not clear how much vitamin D is needed to reach the 75 nmol/L threshold in

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97% of older adults, so as to ensure optimal fall and fracture prevention [2]. However, based on a recent trial in Swiss hip fracture patients, this threshold may be reached in 93% of older adults with a daily vitamin D intake of 2000 IU [4].

**For patients with documented severe vitamin D deficiency (25(OH)D concentrations < 25 nmol/L or < 10 ng/mL),** the panel supports the recent recommendations of the US Endocrine Society [5] (see Table 1). These recommendations also apply for subjects at high risk for vitamin D deficiency (Table 2; see full report).

The panel concludes that sunlight as a source of vitamin D is not without risk, nor is it a reliable source of vitamin D due to seasonal variation – sun intensity is insufficient to produce significant amounts of vitamin D between November and the end of April. Accordingly, blood concentrations of 25(OH)D decline by about 20 nmol/L during the winter. In addition, sun protection is widely used in the population, and skin production of vitamin D declines with age. Furthermore, natural nutritional sources of vitamin D are limited. This means that a sufficient vitamin D supply is only achieved in individuals regularly and directly exposed to sufficient sunlight or in those taking **oral supplements**. To ensure effective supplementation, it would be desirable for consumers to have a choice of effective food supplements and fortified foods from retailers, in addition to the vitamin D in drop or tablet form which is currently available over the counter in pharmacies and drugstores.

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