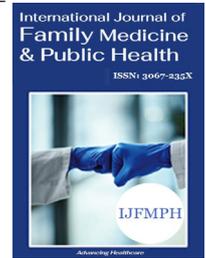




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Vitamin D3 Supplementation: The Recommended Dosages Vary Internationally. What Should Be Done?

Manfred Doepp

HolisticCenter, 13 Haupt St., Abtwil 9030, Switzerland; Web: www.drdoepp.org; Email: holisticcenter1@yahoo.de



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ABSTRACT

If you ask a citizen what the most important vitamins are, they usually answer: vitamin B12 and D3. Good. While there are hardly any problems with the dosage of water-soluble B12, doctors and health officials are often afraid of overdosing or even poisoning with D3. On the other hand, reports of the excellent effects of D3 are increasing in the literature. However, there is no uniformity regarding dosages and normal ranges. The author points out this situation and recommends increasing the dosages. The negative effects of D3 deficiency are much more serious than a possible overdosage. .

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Introduction

New knowledge is constantly being gained regarding the daily intake of vitamin D3. Studies of over 36,000 people have shown that a daily vitamin D3 intake of 800 IU reduces the risk of hip fracture and falls in older adults with vitamin D3 deficiency (inadequate sun exposure) [1]. In recent years, large randomized trials with vitamin D3 supplementation of 2,000 IU in healthy people without deficiency at the age of 50 (VITAL) [2]. and at the age of 70 (DO-HEALTH) have shown a benefit for the immune system with a reduction in cancer, cancer mortality and autoimmune diseases [3].

Only a few foods contain significant amounts of vitamin D3 (wild salmon, oily fish, cod liver oil). The biological half-life of 25-hydroxy-vitamin D is only 2-3 weeks [4].

In general, it can be assumed that dosages have shown an upward trend in recent years. The Swiss company Streuli, for example, sells ampoules containing 300,000 IU [5]. This is despite the fact that the recommended daily dose in Switzerland is 800 IU. (*Vitamin D3 Streuli®, intramuscular injection solution, Streuli Pharma AG, 1 ampoule of 1 ml contains: Cholecalciferolum 300'000 I.U.*). Conversion: 100 µg = 4,000 IU. The author recommends this injection once a month for patients over 50 years of age in the eight months with little sunshine. These injections are also standard for cancer treatment.

Vitamin D3 is known to play a central role in bone metabolism, the immune system and probably also in chronic diseases. Nevertheless, the recommendations for optimal and maximum daily intake of vitamin D3 vary considerably in different countries [6,7]. This is due to a variety of factors, which are listed.

a) Different assessments of scientific evidence

International expert bodies such as the EFSA (Europe, [8]), the Institute of Medicine (IOM, National Academies of Medicine, USA/Canada, [9]), the WHO [10,11] or the Endocrine Society [12,13] often use the same studies for their recommendations, but weight the results differently. While conservative recommendations (e.g. IOM) are primarily based on bone metabolism, others (e.g. Endocrine Society) are based on more recent studies on the prevention of chronic diseases, diabetes mellitus and even cancer. This leads to different reference values.

b) Geographical differences in solar radiation

As vitamin D3 is primarily formed in the skin through exposure to sunlight, the natural supply status varies greatly from region to region. In northern countries with long, sunless winters (e.g. Scandinavia, Canada), the body's own production is hardly possible in winter, which leads to higher recommendations. Inuit, who have hardly any sun, obtain their supply from seals and fish. In sunny regions, smaller amounts are sufficient. The use of sun protection creams with a high protection factor can even lead to a deficiency. The author pointed out that using sunscreen and protective eyewear can increase the risk of developing melanoma [14].

c) Definitions of an "adequate" vitamin D3 status

The target values for an "adequate" 25(OH)D blood level differ:

- WHO and EFSA: ≥ 20 ng/ml = 50 nmol/l
- Endocrine Society: ≥ 30 ng/ml = 75 nmol/l

A higher target value thus leads to higher recommended dosages.

d) Various health policy strategies

Some countries rely on preventive supplementation to avoid possible secondary diseases at an early stage (e.g. Poland, Italy). Other countries recommend vitamin D3 only for people at risk or after a blood test to avoid overdosing (e.g. Germany, Switzerland). This shows different medical priorities.

e) Different assessment of possible risks

Whether high doses ($> 4,000$ IU/day) can be harmless or even harmful in the long term is the subject of controversial debate. This results in different upper limits (so-called Tolerable Upper Intake Levels, UL):

- EU/USA: 100 µg = 4,000 IU
- Australia: 80 µg = 3,200 IU

Interim Conclusion

The internationally inconsistent dosage recommendations for vitamin D3 are the result of complex interactions between scientific evidence, geographical circumstances, political strategies and medical guidelines. While a minimum for the prevention of deficiency diseases (e.g. for rickets prophylaxis) is undisputed, the optimal intake for long-term health and prevention is the subject of controversy.

* Corresponding author.

Manfred Doepp, HolisticCenter, 13 Haupt St., Abtwil 9030, Switzerland; Web: www.drdoepp.org; Email: holisticcenter1@yahoo.de

Vitamin D3 dosages in different countries

Here is a structured overview of the optimal (recommended) and maximum (permitted) doses of vitamin D3 in various countries:

Recommended Daily Allowances (AI/RDA)

USA / Canada (IOM)	15 µg (600 IU)
Europe (EFSA)	15 µg (600 IU)
D-A-CH (D, A, CH)	20 µg (800 IU)
UK (SACN)	10 µg (400 IU)
Australia / NZ	5-15 µg (200-600 IU)
Japan	5.5 µg (220 IU)
Turkey (TEMD)	15 µg (600 IU)

Lowest recommendations:

Australia: 5 µg (200 IU) for under 50s

UK: 10 µg (400 IU)

Highest recommendations:

D-A-CH region: 20 µg (800 IU)

Tolerable Upper Intake Levels (UL)

USA & EU: 100 µg (4,000 IU)

GrassrootsHealth

GrassrootsHealth data show higher doses, e.g. Netherlands: 125 µg (5 000 IU), Denmark: 105 µg, higher than the official ULs [15].

Recommended daily doses vary between 5 µg (200 IU) and 20 µg (800 IU) - lowest in Australia/NZ, highest in Germany/Austria/Switzerland (D-A-CH).

Maximum upper limits (UL) are between 80 µg (3,200 IU) in Australia/NZ and 100 µg (4,000 IU) in the USA/EU. Individual cases with up to 250 µg (10,000 IU) daily intake occur in grassroots groups [16].

Normal Ranges

It would be logical to point out the possibility of determining vitamin D3 in the blood. However, a similar picture emerges here: the normal ranges and upper normal limits vary. The normal values for vitamin D in the blood (measured as 25-hydroxyvitamin D, or 25(OH)D for short) differ depending on the specialist association and country. The assessment ranges from "deficiency" to "optimal", and there is no globally standardized reference range. The official values in some countries:

Normal ranges for 25(OH)D in blood (ng/ml x 2.5 = nmol/l).

Country	Deficiency	Sufficient	Target value
Germany (DGE)	< 20 ng/ml	50 ng/ml	≥ 20 ng/ml
Univ. lab. Munich:	< 20 ng/ml	20-50 ng/ml	> 50 ng/ml
Austria / Switzerland	< 20 ng/ml	20-50 ng/ml	30-50 ng/ml
USA (IOM/NAM)	< 12 ng/ml	< 30 nmol/l	20-30 ng/ml
USA (Endocr Soc)	< 20 ng/ml	≥ 30 ng/ml	75 nmol/l
Canada (Health Can)	< 30 nmol/l	≥ 50 nmol/l	
UK (NHS / NICE)	< 10 ng/ml	< 25 nmol/l	≥ 10 ng/ml
Norway	< 20 ng/ml	20-50 ng/ml	~30-50 ng/ml
WHO	< 20 ng/ml	≥ 20 ng/ml	

Discussion

In the author's experience, a lower normal limit of D3 in the blood of 10 or 20 ng/ml is unacceptable. Patients with these values are at risk of cancer. The normal range should be between 50 and 100 ng/ml. The author considers 100 ng/ml to be the optimum value. Intoxication has never been observed in patients with those values. Grassroot patients often have significantly higher values without side effects.

As bone density is increasingly receding into the background as the most important criterion [17] and the prophylaxis of serious diseases is coming to the fore, this assessment should be discussed more widely. In the VITAL studies, a dosage of 2,000 IU/day resulted in a reduction in serious cancers [18], a reduction in cancer mortality [19] and a reduction in autoimmune diseases [20].

Conclusions

At a time when the prevalence of civilization diseases is increasing more and more, vitamin D3 must be regarded as an indispensable therapeutic factor. 2000 IU/day should be the standard dose, reaching a blood concentration of 100 ng/ml. It is best administered intramuscularly, as older people suffer more and more from absorption disorders concerning fat-soluble vitamins.

Conflict of Interest: None

Ethical Consideration: Not Required

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