German Federal Institute for Risk Assessment

FAQ

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Vitamin D – sun and exercise promote a good supply

Vitamin D regulates calcium and phosphate metabolism and therefore plays an important role in bone health. It influences muscle strength and contributes to a well-functioning immune system. In humans, vitamin D is mainly produced in the skin under the influence of sunlight. In contrast to the body's own production, vitamin D intake from nutrition only accounts for a relatively small proportion of the vitamin D supply. The German Nutrition Society (DGE) recommends an estimated adequate intake of 20 micrograms or 800 international units (IU) of vitamin D per day for children aged one year and older, adolescents and adults. This value applies in the absence of endogenous production – i.e. based on the assumption that no vitamin D is produced in the skin.

How much vitamin D the body produces varies from person to person and also depends on factors such as latitude and season. According to current knowledge, it is sufficient to expose the face, hands and arms to the sun several times a week for about 5 to 25 minutes, depending on skin type and season, to achieve a sufficient supply. Sunburn should be avoided. With sufficient exposure to sunlight, the body's own production contributes 80 to 90 per cent to the vitamin D supply.

However, sufficient vitamin D levels are not always achieved through the body's own production, especially in the winter months. The body stores vitamin D in fat and muscle tissue, which contributes to the supply in winter. Nevertheless, additional vitamin D intake may be beneficial for certain risk groups. These include, for example, older people, especially those who are unable to spend much time outdoors due to illness or the need for care.

People with adequate vitamin D levels generally do not benefit from taking vitamin D supplements. A general recommendation for the healthy general population to take vitamin D supplements to prevent disease is therefore not justified. The BfR has summarised frequently asked questions and answers about vitamin D below.

What is vitamin D and why does the body need it?

Vitamin D occupies a special position among vitamins: unlike other vitamins that must be taken up with food, vitamin D can be formed from precursors present in the body. This requires exposure of the skin to sunlight. Compared to vitamin D intake through food, the body's own production makes a significantly greater contribution to the human supply of this vitamin.

Vitamin D is involved in numerous metabolic processes in the body. It regulates calcium and phosphate metabolism, thereby promoting bone density. It also influences muscle strength and contributes to a well-functioning immune system.

How is vitamin D metabolised in the body?

Vitamin D is the generic term for various calciferols. A distinction is made between ergocalciferol (vitamin D2), which is prevalent in mushrooms, and cholecalciferol (vitamin D3), which is prevalent in animals and can also be produced by humans. When exposed to sunlight (UVB radiation), the skin first produces the unstable precursor previtamin D3, which is then quickly converted into vitamin D3 and transported to the liver via the blood.

Vitamin D2 and D3 supplied through food are taken up in the small intestine and also transported to the liver via the bloodstream. There, the two forms of vitamin D are converted into 25-hydroxyvitamin D precursors, also known as calcidiol. Only in the kidneys is calcidiol converted into the active form calcitriol (1α,25-dihydroxyvitamin D), which then has the actual effect on the target organs.

Under physiological conditions, the body can also convert excess vitamin D into inactive forms of vitamin D, thereby preventing oversupply.

In addition to the main pathway via the liver and kidneys, numerous other body tissues can also convert vitamin D into its active form.

How does biologically active vitamin D (calcitriol) exert its effect?

Biologically active calcitriol (1α,25-dihydroxyvitamin D) reaches the target organs via the blood, where it binds to the vitamin D receptor within the cells and is transported to the cell nucleus. There, the vitamin receptor complex binds to specific sites in the genome (deoxyribonucleic acid, DNA), causing certain genes to be read and various proteins to be formed. These can regulate different processes in the cells. For example, this leads to the formation of more calcium channels in the kidneys and small intestine, which ensure that calcium is absorbed into the blood. Bone mineralisation is also regulated via the vitamin D receptor.

The fact that the vitamin D receptor is found throughout almost the entire body indicates that vitamin D may have many other effects in addition those on bone health.

Which vitamin D compounds may be added to common foods or food supplements?

Cholecalciferol (vitamin D3) and ergocalciferol (vitamin D2) are generally permitted in the European Union (EU) for in the purpose of food fortification and for use in food

supplements. In Germany, the fortification of food for general consumption with vitamin D is subject to approval. To date, there are no legally defined maximum levels for the fortification of common foods or food supplements. The BfR has already derived and published proposals for maximum levels for Germany. Uniform maximum levels are also currently being developed at the EU level, taking into account the BfR's proposals.

Furthermore, various foods are authorised in the EU in which the vitamin D concentration is increased by irradiation. These include mushrooms, baker's yeast, yeast-leavened bread and pastries, and milk. In addition, UV-irradiated mushroom powder may be added to numerous different food categories. UV irradiation increases the ergocalciferol concentration in mushrooms and yeast, and increases the cholecalciferol concentration in milk.

As UV irradiation of food is a new method, these foods are considered Novel Foods. Novel Foods are subject to a health risk assessment by the European Food Safety Authority (EFSA), and to authorisation, and the manufacturer must comply with the maximum levels for certain ingredients approved under the novel food procedure, in this case vitamin D.

Furthermore, since May 2024, the addition of calcidiol (25-hydroxyvitamin D) to food supplements has been permitted within the EU. Calcidiol is also considered a Novel Food because it has not yet been used for human consumption. Calcidiol is more easily absorbed from the intestine into the body and increases serum vitamin D levels (based on 25-hydroxyvitamin D levels) more quickly and efficiently than cholecalciferol taken up orally. However, in the range of high doses, the same amount of calcidiol carries a higher risk of adverse health effects than the same amount of cholecalciferol. The maximum permitted amount of calcidiol as a novel food in food supplements is 10 µg per day for children aged 11 and above and adults, and 5 µg per day for children aged 3 to 10.

The addition of biologically active calcitriol (1α,25-dihydroxyvitamin D) to common foods or food supplements is not permitted. It is used as a medicine, for example in patients with kidney failure, to treat dysfunctional calcium and phosphate metabolism, as these individuals are unable to produce calcitriol or can only produce very small amounts. Calcitriol is highly potent. Medically indicated use requires close medical supervision, as there is a significant risk of excessive serum calcium levels (hypercalcaemia), which can be harmful to health.

What is the difference between food supplements containing vitamin D and medicines containing vitamin D?

Medicines are intended to cure, alleviate or prevent diseases or pathological conditions. They are subject to approval and manufacturers must prove their efficacy and safety to an authority (German Federal Institute for Drugs and Medical Devices, BfArM, or the European Medicines Agency, EMA). The quantities stated on the packaging of prescription-only pharmaceutically manufactured medicinal products may not deviate by more than five per cent from the actual dosage of the substance.

Food supplements are foodstuffs and serve to supplement the general diet. They are not subject to approval but only have to be notified to the German Federal Office of Consumer Protection and Food Safety (BVL). Their nutritional or physiological effects and safety do not have to be determined by an authority – the manufacturer or food business operator is responsible for safety. In contrast to the narrow ranges of variation for the amounts of

ingredients in prescription-only pharmaceutically manufactured medicinal products, the amounts stated on the packaging of food supplements – with the exception of technological additives – may deviate by up to 50 per cent from the actual amount in the product, according to the German Federal Office of Consumer Protection and Food Safety (BVL).

As there are no maximum quantities for food supplements, some food supplements containing vitamin D have (much) higher concentrations of vitamin D than certain medicines containing vitamin D.

What is the effect of single high doses of vitamin D (bolus doses)?

In clinical studies with high-dose bolus doses of vitamin D administered once a year, an increase in falls and fractures was reported in the vitamin D group compared to the control group. Monthly high-dose bolus doses also led to an increased risk of falls compared to lower doses. Therefore, if vitamin D supplements are taken, high-dose bolus doses should be avoided. Higher doses prescribed by a doctor are not assessed here.

How is vitamin D status measured?

A suitable biomarker for checking the supply status is the total serum concentration of 25-hydroxyvitamin D, i.e. the sum of 25-hydroxyvitamin D2 and D3. 25-hydroxyvitamin D occurs in relatively high concentrations in serum and has a long half-life compared to other vitamin D metabolites. As it is biologically inactive, it is not subject to any hormonal feedback mechanism. The serum concentration is therefore only influenced by the body's own synthesis in the skin and the amount of vitamin D absorbed from food.

The measurement of the active metabolite 1α,25-dihydroxyvitamin D (calcitriol) is usually only used in medical diagnostics to clarify congenital or acquired vitamin D metabolic disorders.

Despite refinements in analytics, measuring vitamin D status remains challenging, and results often vary depending on the method used, between individual tests or even between laboratories. Methods such as automated immunoassays or mass spectrometry methods are used. The advantage of automated assays is that they are simple and easy to use and often less expensive than mass spectrometry. However, most automated immunoassays are less effective at detecting vitamin D2. There is therefore a risk that vitamin D levels may be underestimated in people who consume mainly vitamin D2. This may be the case, for example, in people who primarily follow a plant-based diet and consume enriched food or food supplements that mainly contain vitamin D2.

When interpreting the measurement results, it should also be taken into account that laboratories sometimes use different limit values to determine vitamin D deficiency. Some laboratories define vitamin D deficiency as 25-hydroxyvitamin D levels below 75 nmol/l (30 ng/ml), while others classify serum levels below 50 nmol/l (20 ng/ml) as insufficient.

How much vitamin D do humans need and what are adequate serum levels?

According to the German Nutrition Society (DGE), the estimated value for an adequate vitamin D intake in the absence of the body's own production is 20 micrograms per day. In

other words, anyone who does not spend any time outdoors in daylight and therefore does not produce vitamin D themselves should consume 20 micrograms of vitamin D daily. This value, derived from studies, applies to all age groups from the age of one.

However, this scenario is unrealistic for most people: with regular outdoor exposure and sufficient sunlight, the body's own (endogenous) production in the skin contributes around 80 to 90 per cent to vitamin D supply. Vitamin D intake through nutrition with normal food only accounts for a relatively small proportion (10 to 20 per cent) of the supply.

Therefore, measuring vitamin D intake from nutrition is not a suitable way to assess actual vitamin D status. Instead, the concentration of 25-hydroxyvitamin D in blood serum is used as a marker for assessing vitamin D status. It reflects both vitamin D intake from nutrition and the body's own vitamin D production.

However, there has been a long-standing debate as to whether a 25-hydroxyvitamin D level of 75 nmol/l (30 ng/ml) or 50 nmol/l (20 ng/ml) is adequate. Since 2024, the Society for Endocrinology has, due to a lack of scientific evidence, no longer recommended a specific value for defining vitamin D status.

As a guideline value for the healthy population, the BfR uses the 25-hydroxyvitamin D serum value of 50 nmol/l (20 ng/ml) derived by the former Institute of Medicine (IOM, now: National Academy of Medicine, NAM), which reflects an adequate supply for bone health for almost all individuals in a population. This value is also considered appropriate by the German Nutrition Society (DGE) and the European Food Safety Authority (EFSA).

However, it should be noted that the physiological requirement for vitamin D varies from person to person. This means that a serum level of 50 nmol/l is sufficient to meet the needs of even those with very high requirements. For most people, this level is already above the actual individual requirement for good bone health.

Serum levels between 30 nmol/l (12 ng/ml) and 50 nmol/l (20 ng/ml) are considered suboptimal, although not everyone with these serum levels is necessarily undersupplied, depending on individual needs.

A risk of vitamin D deficiency only occurs y when serum levels fall below 30 nmol/l (12 ng/ml). In the long term the deficiency also leads to an increased risk of osteomalacia (bone softening) and rickets.

A study has shown that almost all participants with serum levels above approximately 50 nmol/l (20 ng/ml) broke down vitamin D, suggesting that their requirements – even beyond bone health – were more than adequately met.

In the absence of the body's own vitamin D production, an adequate vitamin D serum concentration of 50 nmol/l is achieved with an intake of 20 µg of vitamin D per day.

What vitamin D serum levels are measured in the German population?

In Germany, based on the derived values of the former IOM, approximately 54 per cent of children and adolescents and 44 per cent of adults have desirable vitamin D serum levels of 50 nmol/l (20 ng/ml) and above, while around 13 per cent of children and adolescents and 15 per cent of adults have serum levels below 30 nmol/l (12 ng/ml), putting them at risk of vitamin D deficiency. Around 33 per cent of children and adolescents and 41 per cent of

adults are in the suboptimal domain with serum levels of 30 to 50 nmol/l or 12 to 20 ng/ml. Sixteen per cent of children and 9 per cent of adults in Germany have serum levels above 75 nmol/l.

How much sun does the body need to produce sufficient vitamin D? How does this compare in autumn and winter to summer?

The body's own vitamin D production in the skin via sunlight (UVB radiation) depends on latitude, time of year and time of day, weather conditions, clothing, length of time spent outdoors, and skin type. The use of sunscreen also affects vitamin D supply, as it reduces the body's own production. This means that the contribution of the body's own production to vitamin D supply varies greatly from person to person and cannot be determined quantitatively for individuals or for the general population as a whole.

During the summer months, it is possible to achieve the desired serum concentration of 25-hydroxyvitamin D of 50 nmol/l through the body's own production, including in Germany. For about half of the year, it is sufficient to expose about a quarter of the body surface (face, hands and parts of the arms and legs) to the sun for 5 to 25 minutes several times a week, depending on skin type and season. If you are exposed to the sun for longer periods of time, appropriate measures should be taken (e.g. sunscreen, protective clothing) to avoid sunburn. This is because frequent sunburn increases the risk of developing skin cancer.

In contrast to the summer months, the sun's rays in Germany are not strong enough between October and March to ensure sufficient vitamin D production. However, the body stores vitamin D in fat and muscle tissue. Physical activity can release it and contribute to the body's supply in winter.

Can vitamin D be stored in the body?

As vitamin D is fat-soluble, it can be stored very well in the body. The main storage locations for vitamin D are the fat and muscle tissue of the human body; smaller amounts are also found in the liver.

How much vitamin D is naturally present in food?

There are only a few foods, mostly of animal origin, that contain significant amounts of vitamin D. These include, in particular, fatty fish (e.g. eel, herring, mackerel, salmon) and, to a lesser extent, eggs, mushrooms, beef liver, cheese, butter and milk. In Germany a normal diet provides only 2 to 4 micrograms of vitamin D per day.

Table1 : Natural vitamin D concentration of some common food (German Food Code and Nutrient Data Base (BLS) 3.02)

food	Vitamin D (micrograms per 100 grams)
Eel (smoked)	90.0
Herring (salted)	25.6
Mackerel (smoked)	6.9
Salmon (smoked)	4.2
Whole chicken egg (raw)	2.9
Mushrooms (raw)	1.9
Beef liver (fried)	1.4
Gouda cheese	1.3
Butter	1.2
Cow's milk 3.5% fat	0.1

What are the consequences of vitamin D deficiency?

Long-term severe vitamin D deficiency in infants and children increases the risk of insufficient mineralisation of the growth plates – a condition known as rickets. Rickets is always accompanied by insufficient mineralisation of the bones (osteomalacia). In adults, a vitamin D deficiency no longer leads to growth disorders (rickets) due to closed growth plates, but only to osteomalacia. This mineralisation disorder forms soft bones that can be deformed under mechanical stress.

Vitamin D deficiency can also contribute to the formation of osteoporosis, especially in older people. However, osteoporosis is a multifactorial disease, meaning that numerous other factors are involved in its development.

In addition, there is a link between low vitamin D levels and increased susceptibility to infections, muscle cramps, and muscle and bone pain. People with low vitamin D levels also often experience symptoms such as fatigue, weight gain, mood swings and hair loss; however, a clear cause-and-effect relationship has not been proven for these mostly non-specific symptoms.

Which groups are at risk of vitamin D deficiency?

Risk groups for deficiency include people who spend little or no time outdoors (or are unable to do so) or who, for cultural or religious reasons, only go outside with their bodies completely covered. People with dark skin are also at risk, as they are less able to produce vitamin D than people with light skin due to the higher concentration of melanin in their skin.

Another major risk group is older people, as vitamin D production decreases significantly with age and the older population also includes people with limited mobility, chronic illnesses and those in need of care who spend little or no time outdoors.

Finally, infants are among the risk groups for vitamin D deficiency, as the concentration of vitamin D in breast milk is very low and infants should not be exposed to direct sunlight because their skin's own protective mechanism has yet to develop. To ensure that infants receive sufficient vitamin D, the daily administration of vitamin D tablets (400–500 international units, corresponding to 10 to 12.5 µg per day; vitamin D prophylaxis) is recommended in Germany until the child's second early summer.

Is the body's own vitamin D production still sufficient in old age?

In old age, the skin's ability to produce vitamin D decreases significantly and can be reduced to less than half compared to younger ages. If older people also spend less time outdoors and thus have limited exposure to sunlight on their skin, the body's own vitamin D production decreases even further. This is particularly common in older people with limited mobility, chronic illnesses and those in need of care (nursing home residents, geriatric patients). Vitamin D deficiency is often found in these individuals. Therefore, additional vitamin D intake may be beneficial for these groups of people, especially during the winter months. This does not generally apply to (older) people who spend a lot of time outdoors.

Should you go to a solarium to improve your vitamin D supply?

Due to the potential health risks, it is not advisable to go to a solarium to improve your vitamin D supply. The UV radiation used in solariums can increase the risk of skin cancer, among other things. More information on this can be found, for example, at the Federal Office for Radiation Protection.

Is it possible to overdose on vitamin D from the body's own synthesis?

No, vitamin D overdose from the body's own synthesis is not possible. Vitamin d overdoses and thus undesirable effects are only possible from excessive oral intake (long-term > 100 micrograms per day), for example by using vitamin D supplements.

Does it make sense to fortify food with vitamin D?

Since part of the population has insufficient vitamin D levels, the conditions for fortifying food with vitamin D in accordance with the European Union (EU) Fortification Regulation are generally met. This is because fortification can improve the supply to the population or parts of it. At the same time, care must be taken to ensure that the population is not oversupplied, as this also poses health risks.

In the opinion of the BfR, general fortification of food with vitamin D is not recommended. Instead, targeted fortification of food categories that are consumed in relatively consistent amounts by large sections of the population should be carried out. The BfR has developed a vitamin D fortification concept in which it proposes maximum levels for the addition of vitamin D to certain food groups. The aim of the concept is to design the possible fortification of food with vitamin D in such a way that excessive total intake levels that are harmful to health are avoided in all age groups, while at the same time making a meaningful contribution to the population's supply.

From the BfR's point of view, the addition of vitamin D to the following food is suitable for achieving this goal:

- Milk and dairy produce (including cheese): maximum 1.5 µg per 100 g
- Bread and baked goods (except pastries) and breakfast cereals: maximum 5 µg per 100 g
- Spreadable fats and edible oils (as these are already authorised) (including liquid vegetable fat preparations and vegetable creams): maximum 7.5 µg per 100 g

The BfR's vitamin D fortification concept is a recommendation; it is not legally binding.

At EU level, uniform maximum levels for vitamins and minerals (including vitamin D) for the fortification of food and for the addition to food supplements are currently being developed, taking into account the proposals of the Member States. These are to be regulated by law in the future and will thus be legally binding in all EU Member States.

Is it advisable to take vitamin D supplements?

The results of large clinical studies on vitamin D published in recent years show that people with adequate vitamin D levels generally do not benefit from taking additional vitamin D. Based on the current scientific data, a general recommendation to take vitamin D supplements to prevent disease is therefore not justified.

However, sufficient vitamin D levels are not always achieved through the body's own production, which depends not only on sunlight exposure but also on age and skin type, among other factors. Therefore, additional intake of vitamin D via supplements may be beneficial for certain groups of people, especially during the winter months. The relevant risk groups are listed under the question "Which groups are at risk of vitamin D deficiency?"

Vitamin D deficiency can be particularly widespread among residents of care facilities. According to the BfR, general supplementation with vitamin D up to 20 µg (800 IU) per day should therefore be considered for this risk group. With 20 µg (800 IU) of vitamin D per day, an adequate supply can generally be ensured without any exposure of the skin to sunlight.

From a medical point of view, higher doses may be prescribed in certain cases. However, serum levels should be monitored regularly alongside supplementation.

Special conditions apply to infants, as they should not be exposed to direct sunlight. To ensure that this group receives sufficient vitamin D, daily vitamin D tablets are recommended in Germany until the child's second early summer (400–500 international units, corresponding to 10 to 12.5 µg per day; vitamin D prophylaxis).

What total vitamin D intake levels are expected to cause no long-term health impairment?

In 2023, the European Food Safety Authority (EFSA) updated the Tolerable Upper Intake Level (UL) for vitamin D per day. The UL refers to intake from all food sources, including food supplements containing vitamin D and enriched food. The UL is not a recommended intake.

Table 2: Tolerable Upper Intake Level (UL) for vitamin D intake (EFSA, 2023)

Age	Tolerable Upper Intake Level (UL)	
Months/years	Micrograms (µg) per day	International units (IU) per day
0 to 6 months	25	1,000
7 to 11 months	35	1,400
1 to 10 years	50	2,000
11 to 17 years	100	4,000
Adults (including pregnant and breastfeeding women)	100	4,000

Regular daily intake of vitamin D above the UL increases the risk of adverse effects. Given normal dietary habits and the fact that food naturally contains only small amounts of vitamin D, this is currently only possible through the intake of high-dose vitamin D preparations.

What are the health consequences of vitamin D excess?

Vitamin D overdoses and the resulting adverse effects are only caused by excessive oral intake and not by the body's own production. In particular, studies have shown that additional long-term use of high-dose food supplements containing 100 micrograms or 4,000 international units (IU) of vitamin D or more per daily dose may be associated with an increased risk of adverse health effects. These include a decrease in bone density in older women, an increased risk of falls, and a deterioration in heart function in people with heart disease.

Case reports of poisoning in children and adults have been reported after intake of excessive doses of vitamin D. These were characterised by a marked increase in serum calcium levels. Symptoms of such hypercalcaemia can include fatigue, muscle weakness, nausea, cardiac arrhythmia and weight loss. If hypercalcaemia persists for a longer time, it can lead to kidney stones and kidney calcification, and even to an (irreversible) decline in kidney function.

Does taking vitamin D supplements protect against cancer or other diseases?

In a number of observational studies, low vitamin D levels were correlated with an increased risk of extraskeletal diseases such as cancer, cardiovascular disease, type 2 diabetes, depression, asthma and respiratory infections. Based on these study results, there are high expectations that taking vitamin D preparations, which are available as medicines and also over the counter as a food supplement, could protect against these diseases or alleviate their progression. However, this has not yet been scientifically proven. It is also conceivable, for example, that the low vitamin D levels measured are a consequence of the diseases identified – and not the cause.

In recent years, results from large placebo-controlled studies on the potential benefits of vitamin D supplements involving more than 2,000 participants and lasting between 2.5 and 5.3 years have been published. In almost all of these studies, the participants already had adequate vitamin D serum levels (approximately 55 to 80 nmol/l or 22 to 32 ng/ml) at the start of the study. While vitamin D levels remained almost constant with placebo administration, the administration of vitamin D supplements in these studies led to a clear increase in serum levels. However, the further increase in vitamin D serum levels (from already adequate to supra-physiological domain) showed no additional benefit for the prevention of the diseases or health impairments investigated. These included cancer, cardiovascular disease, bone fractures, falls, growth and bone density. In contrast, a positive effect was observed in autoimmune diseases.

Based on the current scientific data, a general recommendation to take vitamin D supplements for the prevention of diseases cannot be justified. However, vitamin D deficiency should be avoided at all costs. A detailed opinion on the suitability of food supplements containing vitamin D can be found here.

What is the maximum amount of vitamin D in food supplements recommended by the BfR?

Anyone who wants to supplement their diet with vitamin D via a food supplement should use products containing up to approximately 20 µg of vitamin D (800 IU) per day, as this dose is not associated with any adverse health effects, even when taken over a long period of time and taking into account other sources of vitamin D (e.g. enriched food).

What can consumers do to ensure their vitamin D supply?

Those who want to do something for their health and support a good vitamin D supply should go out into fresh air often, both in summer and in winter. Physical exercise and outdoor activities as well as sport strengthen muscles and bones. It is also recommended to eat oily sea fish once or twice a week, which contains omega-3 fatty acids and iodine in addition to vitamin D. With sufficient time spent outdoors and sufficient sun exposure on the skin, as well as a balanced diet, a good vitamin D supply can be achieved without taking vitamin D supplements.

Further information on vitamin D

BfR opinion: High single doses of vitamin D via food supplements at intervals of days or weeks associated with health risks
https://www.bfr.bund.de/en/opinions/high-single-doses-of-vitamin-d-via-food-supplements-at-intervals-of-days-or-weeks-associated-with-health-risks/

BfR opinion: Food supplements with vitamin D – useful or unnecessary?
https://www.bfr.bund.de/en/opinions/food-supplements-with-vitamin-d-useful-or-unnecessary/

BfR opinion: Vitamin D: consumption of high-dose food supplements is unnecessary
https://www.bfr.bund.de/en/opinions/vitamin-d-consumption-of-high-dose-food-supplements-is-unnecessary/

Information page microco.info on vitamin D:
https://www.microco.info/vitamins/vitamin-d/

About the BfR

The German Federal Institute for Risk Assessment (BfR) is a scientifically independent public health institution within the portfolio of the German Federal Ministry of Agriculture, Food and Regional Identity (BMLEH). The BfR advises the Federal Government and the States ('Laender') on questions of food, feed, chemical and product safety. The BfR conducts independent research on topics that are closely linked to its assessment tasks.

About microco.info

The internet portal www.microco.info provides information on vitamins, minerals and numerous other substances that we ingest with food or that are offered as food supplements. In addition, the individual pages contain the maximum levels of vitamins and minerals in food supplements and in fortified foods as recommended by the German Federal Institute for Risk Assessment (BfR).

This text version is a translation of the original German text which is the only legally binding version.

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