Bundesinstitut für Risikobewertung

Vitamin D, the immune system and COVID-19

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Healthy people in Germany usually consume sufficient amounts of vitamins and minerals through a balanced and varied diet. One of the few exceptions, under certain circumstances may concern vitamin D – important for bones, muscular strength and the immune system.

There is some evidence that insufficient vitamin D serum levels are associated with an increased risk of acute respiratory infections. Such respiratory infections also include COVID-19 disease, for which, however, the information is currently still uncertain. Notably, it has not yet been demonstrated that people that have a good vitamin D supply benefit from additional intake of vitamin D. A general recommendation to use vitamin D supplements to prevent a SARS-CoV-2 infection or severe progression of COVID-19 disease is, therefore, presently not justifiable.

Making the independent decision to take vitamin D supplements on your own at very high doses can pose health risks. Higher doses should only be taken under medical supervision and when accounting for one's individual vitamin D status.

Those who want to supplement vitamin D can do so with a daily dose of up to 20 micrograms (800 international units) of vitamin D. Taking this amount is not expected to lead to health impairments. From the BfR's perspective, a general vitamin D intake of up to 20 micrograms per day should be considered for care home residents. This is because vitamin D is formed in the skin following its exposure to sunlight. However, many elderly people are unable to spend sufficient time outside. Moreover, vitamin D formation decreases significantly with age.

There has been much discussion in recent months in connection with COVID-19 diseases as to whether food supplements might be able to improve individual immune defence and mitigate severe disease progression. All studies conducted thus far on this topic show that a sufficient supply of vitamins and minerals is important for the human body's immune function. In times of increased viral cold and respiratory disease activity, a varied diet with plenty of fruit and vegetables rich in vitamins and minerals is, therefore, especially important. However, there are no studies so far that prove that an intake of vitamins and minerals in excess of the requirement is beneficial for healthy individuals. Since the healthy population in Germany generally consumes sufficient vitamins and minerals through a balanced and varied diet, there is normally no reason to take additional vitamins and minerals through food supplements. Under certain circumstances, Vitamin D may be an exception.

Observational studies show that COVID-19 patients, especially those who are seriously ill, often display vitamin D concentrations in their blood that are too low. However, it is mostly unclear whether the low vitamin D serum levels were already present before the illness or were rather caused by the infection.
Some observational and intervention studies indicate that taking vitamin D supplements can have a positive effect on the progression of a COVID-19 disease. However, according to the German Nutrition Society (DGE), the data are still insufficient here (DGE, 2021) to derive a cause-effect relationship. Reasons for this include study design and study implementation. Furthermore, other risk factors for COVID-19 disease, including old age, cardiovascular diseases, diabetes mellitus, obesity and high blood pressure, were sometimes insufficiently taken into account.

It is scientifically indisputable that a sufficient vitamin D supply contributes to the normal functioning of the immune system. Studies also show that people with an insufficient vitamin D supply have an increased risk of acute respiratory infections and can benefit from vitamin D supplements. Benefits for people with an adequate vitamin D status could not be proven thus far. Therefore, a general recommendation for preventing acute respiratory infections by taking supplements that contain vitamin D is currently not justifiable.

Nevertheless, a good vitamin D supply is important. 25-hydroxy vitamin D serum levels of at least 50 nanomoles per litre – or expressed as nanograms per millilitre: at least 20 nanograms per millilitre – reflect a desirable supply. The best way to achieve this is through the skin's own synthesis. With sufficient exposure to sunlight, the body's own production in the skin contributes to the vitamin D supply[1] to an extent of 80-90 percent. Physical exercise and outdoor activity also strengthen muscles and bones. Furthermore, it is recommended to eat oily sea fish, such as herring or salmon, once or twice a week.

However, not everyone achieves sufficient vitamin D levels through the body's own production from exposure to sunlight. Additional vitamin D intake may, therefore, be appropriate for certain groups of people, especially during the winter months. Those who want to supplement vitamin D should turn to food supplements with up to 20 micrograms of vitamin D (800 international units) per day since this dose is not associated with any health concerns.

The use of food supplements may be particularly appropriate for people who belong to a risk group for insufficient vitamin D supply. Risk groups include people who spend little or no time outside or, for example, for cultural or religious reasons, only go outside with their bodies completely covered. Furthermore, people with dark skin belong to the risk groups since they produce less vitamin D than people with light skin due to the high concentration of the skin pigment melanin. Another important risk group includes elderly people because vitamin D formation decreases significantly with age. There are also often individuals among the elderly population who display limited mobility, who are chronically ill or in need of care, who are unable to spend time outside at all or spend very little time outside. Hence, Vitamin D deficiency can be particularly widespread among care home residents. For this risk group, general supplementation with up to 20 micrograms of vitamin D per day should, therefore, be considered. From a medical perspective, in certain cases there might be an indication for higher doses. Parallel to supplementation, serum levels should be monitored regularly.

In the case of additional vitamin D intake via food supplements, it is noted that the European Food Safety Authority (EFSA) has derived a tolerable upper intake level (UL) of 100 micrograms (4,000 international units) for intake of vitamin D per day for adults and children aged 11 and over. A UL of 50 micrograms (2,000 international units) per day was derived for younger children aged between 1 and 10. This tolerable upper intake level refers to intake from all food sources, including supplements that contain vitamin D and vitamin D-enriched foods. The UL does not represent an intake recommendation. A regular daily vitamin D intake above the UL increases the risk of adverse effects, such as the formation of kidney stones or renal calcification. In the context of usual dietary habits, this is currently only possible by taking high-dose vitamin D supplements.

[1] Special conditions apply to infants (medically controlled vitamin D prophylaxis with 10-12.5 micrograms per day) since infants should not be exposed to direct sunlight.

However, for therapeutically reasons, meaning as part of medical treatment, higher vitamin D intake amounts may be necessary. Consuming higher doses and very high quantities in particular, should take place only under medical supervision and when accounting for one's individual vitamin D status. Case reports have shown that the uncontrolled intake of vitamin D supplements at very high doses under one's own direction can have serious health consequences, such as acute renal failure.

Food supplements are not intended to treat, heal or mitigate the symptoms of a disease or illness. Food supplements are not medicines but are food products that can supplement a normal diet. Food supplements must be safe and must not cause any adverse health effects.

Further information on the topic of food supplements, vitamin D and COVID-19 can be found on the BfR website

A-Z index of food supplements:
https://www.bfr.bund.de/en/a-z_index/food_supplements-129789.html

Selected questions and answers on vitamin D:
https://www.bfr.bund.de/cm/349/selected-questions-and-answers-on-vitamin-d.40414212.pdf

Selected questions and answers on the COVID-19:
https://www.bfr.bund.de/en/can_the_new_type_of_coronavirus_be_transmitted_via_food_and_objects_-244090.html

Information from the German Nutrition Society (DGE) on the topic of vitamin D and COVID-19 (in German)

https://www.dge.de/wissenschaft/weitere-publikationen/fachinformationen/vitamin-d-und-covid-19/

https://www.dge.de/presse/pm/vitamin-d-und-covid-19/

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