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Vitamin D is both a nutrient we eat and a hormone that our body makes. It is a fat-soluble vitamin that has long been known for the body to absorb and hold calcium and phosphorus; both are crucial for bone building. Laboratory studies also show that vitamin D can reduce the growth of cancer cells, control infections and reduce inflammation. Many organs and tissues of the body have receptors for vitamin D, which suggest important roles beyond bone health, and scientists are actively investigating other possible functions. Few foods naturally contain vitamin D, although some foods are enriched with the vitamin. For most people, the best way to get enough vitamin D is to take a supplement because it is hard to eat enough through food. Vitamin D supplements are available in two forms: Vitamin D2 (Ergocalciferol or Pre-Vitamin D) and Vitamin D3 (Cholecalciferol). Both are also naturally occurring forms produced in the presence of the sun's ultraviolet B rays (UVB), hence their nickname, the sunshine vitamin, but D2 is produced in plants and fungi and D3 in animals, including humans. Vitamin D production in the skin is the primary natural source of vitamin D, but many people have insufficient levels because they live in places where sunlight is limited in winter, or because they have limited sunlight because they are in time. Even people with darker skin tend to have lower blood levels of vitamin D because the pigment (melanin) acts as a shadow, reducing the production of vitamin D (and also reducing the harmful effects of sunlight on the skin, including skin cancer). Recommended amounts The recommended dietary supplement for vitamin D provides the daily amount needed to maintain healthy bones and normal calcium metabolism in healthy people. It assumes minimal sunlight. RDA: The recommended dietary supplement for adults aged 19 and over is 600 IU per day for men and women, and for adults >70 years it is 800 IU daily. UL: The tolerable upper intake level is the maximum daily probability of absorption, which should not have any harmful effects on health. UI for vitamin D for adults and children 9 years and older is 4,000 IU. Many people may not meet the minimum requirement for the vitamin. NHANES data showed that median intake of vitamin D from foods and dietary supplements in women aged 51 to 71 years was 308 IU per day, but only 140 IU from foods alone (including fortified products). [1] Worldwide, an estimated 1 billion people have insufficient vitamin D levels in their blood, and there is a lack of vitamin D in all and age groups. [2-4] In the developed world, doctors are experiencing the resurgence of rickets, the bone-debilitating disease that had been largely eradicated by vitamin D enrichment. [5-7] There is a scientific debate about how much vitamin D people need every day and what the optimal serum levels should be to prevent disease. In November 2010, the Institute of Medicine (IOM) published recommendations to increase daily vitamin D intake for adults in the U.S. and Canada, up to 600 IU per day. [1] The report also increased the cap from 2,000 to 4,000 IU per day. Although some groups, such as The Endocrine Society, recommend 1,500 to 2,000 I.E. daily to achieve adequate serum levels of vitamin D, the IOM said there was not enough evidence to establish a causal and beneficial relationship with vitamin D and health benefits other than bone health. Since then, new evidence has supported other benefits of consuming a sufficient amount of vitamin D, although there is still no consensus on the amount considered appropriate. Vitamin D and health The role of vitamin D in disease prevention is a popular area of research, but clear answers beyond the benefits of taking amounts beyond RDA are inconclusive. Although observational studies show a strong association with lower rates of certain diseases in populations that live in sunnier climates or have higher serum levels of vitamin D, clinical studies that give people vitamin D supplements to affect a particular disease are still inconclusive. This may affect different study designs, differences in absorption rates of vitamin D in different populations and different dosages that are given to participants. Learn more about research on vitamin D and specific health conditions and diseases: Bone health and muscle strength Several studies link low vitamin D blood levels to an increased risk of fractures in older adults, and they suggest that vitamin D supplementation can prevent such fractures – as long as they are taken at a sufficiently high dose. [8-12] A meta-analysis of 12 randomized controlled trials involving more than 42,000 people aged 65+, most of them women, examined vitamin D supplementation with or without calcium and with calcium or a placebo. The researchers found that higher intake of vitamin D supplements – about 500-800 IU per day – reduced hip and non-spider fractures by about 20%, while lower intakes (400 IU or less) did not provide an advantage for fracture prevention. [12] A systematic review examined the effect of vitamin D supplements taken with or without calcium on the prevention of hip fractures (primary result) and fractures of any kind (secondary result) in older men and postmenopausal women aged 65+ years. It included 53 clinical trials involving 91,791 participants who lived independently or in a nursing home or hospital. There was no strong association between vitamin D supplements alone and the prevention of fractures of any kind. However, it found a protective effect of all types of fractures when vitamin D was taken with calcium. All studies used vitamin D supplements with 800 I.E. or less. [13] Vitamin D can also help increase muscle strength, which in turn helps prevent falls, a common problem that leads to significant disabilities and deaths in the elderly. [14-16] A combined analysis of several studies found that taking 700 to 1,000 I.E. vitamin D per day reduced the risk of falls by 19%. Lowered. 200 to 600 IU per day, no such protection. [17] Although taking 800-1,000 IU daily may have benefits for bone health in older adults, it is important to be careful about very high dosage supplements. A clinical study that gave women aged 70+ a once-yearly dose of vitamin D at 500,000 IU for five years increased the risk of falls by 15% and a 26% higher risk of fracture than women who received a placebo. [18] It has been speculated that a super saturation of the body with a rarely given very high dose may actually have promoted lower blood levels of the active form of vitamin D, which may not have occurred at smaller, more frequent doses. [13] Nearly 30 years ago, researchers found a fascinating relationship between colorectal cancer deaths and geographic location: People living at higher latitudes, such as in the northern United States, had higher death rates of colorectal cancer than people living closer to the equator. [19] Many scientific hypotheses about vitamin D and diseases come from studies comparing solar radiation and disease rates in different countries. These studies may be a good starting point for other research, but they may not provide the most definitive information. The sun's UVB rays are weaker at higher latitudes, and in turn, the vitamin D blood levels of people in these areas tend to be lower. This led to the hypothesis that low vitamin D levels could somehow increase the risk of colorectal cancer. [3] Animal and laboratory studies have found that vitamin D can inhibit tumor development and slow the growth of existing tumors, including breast, ovary, colon, prostate, and brain. In humans, epidemiological studies show that higher serum levels of vitamin D are associated with significantly lower rates of colorectal, pancreatic, prostate and other cancers, with the strongest evidence for colorectal cancer. [20-32] However, clinical studies have not found a consistent association: The Women's Health Initiative study, which was followed by an average of about 36,000 women for seven years, found no reduction in the risk of bowel or breast cancer in women who received 400 IU of vitamin D and 1,000 mg of calcium daily compared to those who received a placebo. [33,34] Limitations of the study were suggested: 1) the relatively low dose of vitamin D given, 2) some people in the placebo group decided to take additional calcium and vitamin D supplements on their own, minimizing the differences between the placebo group and the supplement group, and 3) about a third of women who were assigned vitamin D did not take their supplements. 4) Seven years may be too short to be reduced cancer risk. [35,36] A large clinical study called VITamin D and Omega-3 Trial (VITAL) followed 25,871 men and women aged 50+ who were cancer-free at the start of the study and took either a 2,000 I.E. vitamin D supplement or a placebo daily for a median of five years. [37] The results did not show that different rates of breast, prostate and colorectal cancer between vitamin D and placebo groups. The authors noted that a longer follow-up period would be necessary to better assess the possible effects of supplementation, as many cancers take at least 5-10 years to develop. Although vitamin D does not appear to be an important factor in reducing cancer incidence, evidence, including those from randomized trials, suggests that having higher vitamin D status can improve survival if you develop cancer. In the VITAL study, a lower mortality rate from cancer was observed in patients tasked with taking vitamin D, and this benefit seemed to increase over time since it began with vitamin D. A meta-analysis of randomized trials of vitamin D, which included the VITAL study, found a statistically significantly lower cancer mortality risk of 13% in vitamin D patients compared to placebo. [38] These results are consistent with observational data suggesting that vitamin D may have a stronger effect on cancer progression than on incidence. Heart disease The heart is basically a large muscle, and like skeletal muscle, it has receptors for vitamin D. [39] Immune and inflammatory cells, which play a role in cardiovascular diseases such as atherosclerosis, are regulated by vitamin D. [40] The vitamin also helps to keep arterial flexibility and relaxation, which in turn helps to control high blood pressure. [41] The health professionals' follow-up study tracked nearly 50,000 healthy men for 10 years. [42] Those who had the lowest levels of vitamin D were twice as likely to have a heart attack as men who had the highest concentrations. Meta-analysis of epidemiological studies showed that people with the lowest serum levels of vitamin D had a significantly increased risk of stroke and any heart disease event compared to patients with the highest concentrations. [40,43-46] However, taking vitamin D supplements has not been found to reduce cardiovascular risk. A meta-analysis of 51 clinical studies has not shown that vitamin D supplementation reduces the risk of heart attack, stroke or death from cardiovascular disease. [47] THE VITamin D and Omega-3 Trial (VITAL) came to the same conclusion: It was followed by 25,871 men and women free of cardiovascular disease who received either a 2,000 I.E. vitamin D supplement or placebo daily for a median of five years. No association was found between taking the dietary supplements and a lower risk of major cardiovascular events (heart attack, stroke, or death from cardiovascular causes) compared to placebo. [37] Type 2 diabetes vitamin D deficiency may negatively affect the biochemical pathways that lead to the development of type 2 diabetes (T2DM), including impairment of beta-cell function in the pancreas, insulin resistance and inflammation. Prospective observational studies have shown that higher vitamin D blood levels are associated with lower T2DM rates. [48] More than 83,000 women without diabetes were Health study on the development of T2DM. Vitamin D and calcium intake from diet and dietary supplements were evaluated during the 20-year study. [49] The authors found that when comparing women with the highest intake of vitamin D from dietary supplements with women with the lowest intake, there was a 13% lower risk of developing T2DM. The effect was even stronger when vitamin D was combined with calcium: there was a 33% lower T2DM risk in women when comparing the highest calcium and vitamin D intakes from dietary supplements (>1,200 mg, >800 IU daily) with the lowest intake (<600 mg, 400 IU). A randomized clinical trial gave 2,423 adults who had prediabetes either 4000 IU of vitamin D or a placebo daily for two years. The majority of participants did not have vitamin D deficiency at the beginning of the study. After two years, vitamin D blood levels in the supplement compared to placebo group was 54.3 ng/ml compared to 28.2 ng/ml, but no significant differences in rates of T2DM were observed in 2.5-year follow-up. [50] The authors noted that a lack of effect of vitamin D may be due to the fact that the majority of participants had vitamin D blood levels in a normal range of more than 20 ng/ml, which is considered an acceptable level for reducing health risks. Especially among participants who had the lowest blood levels of vitamin D at the beginning of the study, vitamin D supplementation reduced the risk of diabetes. This is consistent with the important concept that taking additional vitamin D may not benefit those who already have adequate blood levels, but those with initially low blood levels may benefit. The role of the immune function vitamin D in regulating the immune system has led scientists to explore two parallel research paths: Does vitamin D deficiency contribute to the development of multiple sclerosis, type 1 diabetes and other so-called autoimmune diseases in which the body's immune system attacks its own organs and tissues? And could vitamin D supplements help strengthen our body's defenses to fight infectious diseases such as tuberculosis and seasonal flu? Multiple sclerosis The rate of multiple sclerosis (MS) is increasing in both developed and developing countries, with an unclear cause. However, a person's genetic background plus environmental factors including insufficient vitamin D and UVB exposure have been identified to increase the risk. [51] Vitamin D was first proposed as a role in MS more than 40 years ago, with observations given at the time, including that MS rates were much higher north (or far south) of the equator in sunnier climates. [52] A prospective study of the dietary intake of vitamin D found that women with a daily intake of more than 400 IU had a 40% lower risk of MS. [53] In a study of healthy young adults in the US, white men and women with the highest levels of vitamin D had a 62% lower risk of developing MS than women with the lowest levels of vitamin D. Vitamin D levels. The study found this effect was not found in black men and women, possibly because there were fewer black study participants and most of them had low levels of vitamin D, making it harder to find a link between vitamin D and MS if there was one. Another prospective study in young adults from Sweden also found a 61% lower RISK for MS with higher serum vitamin D levels; [55] and a prospective study among young Finnish women found that low vitamin D levels in serum were associated with a 43% increased risk of MS. [56] Prospective studies in individuals with MS have been associated with higher vitamin D levels with decreased disease activity and progression. [57,58] While several clinical trials are underway to study vitamin D as a treatment in people with MS, there are no clinical trials to prevent MS, probably because MS is a rare disease and the study should be large and long-lasting. Overall, the current evidence suggests that low vitamin D may have a causal role in MS, and if so, about 40% of cases can be prevented by correcting vitamin D insufficiency. [59] This conclusion has been significantly reinforced by recent evidence that genetically determined low vitamin D levels predict a higher risk of multiple sclerosis. Type 1 type 1 diabetes (T1D) is another disease that varies from geography to region – a child in Finland is about 400 times more likely to develop T1D than a child in Venezuela. [60] While this may be largely due to genetic differences, some studies suggest that T1D rates are lower in sunnier areas. Early evidence that vitamin D could play a role in T1D comes from a 30-year study that followed more than 10,000 Finnish children from birth: Children who regularly received vitamin D supplements in infancy had a nearly 90% lower risk of developing type 1 diabetes than those who did not receive supplements. [61] However, several studies examining the relationship between dietary vitamin D or studies to supplement children at high risk of T1D with vitamin D have produced mixed and inconclusive results [62] About 40% of T1D cases begin in adulthood. A prospective study of healthy young adults in the US found that white individuals with the highest levels of serum vitamin D had a 44% lower risk of developing T1D in adulthood than those with the lowest concentrations. [63] No randomized controlled trials of vitamin D and T1D have been conducted for adults, and it is not clear whether they could be conducted. In more research is needed. Flu and cold The flu virus wreaks the most havoc in winter and inherits in the summer months. This seasonality led a British doctor to hypothesize that a sun-related seasonal stimulus triggered flu outbreaks. [64] More than 20 years after this first hypothesis, several scientists published a paper suggesting that vitamin D may be the seasonal stimulus. [65] Among the evidence they cite: Vitamin D levels are lowest in winter [65] The active form of vitamin D mitigates the harmful inflammatory response of some white blood cells, while also increasing the production of microbe-fighting proteins by immune cells. [65] Children with vitamin D

deficiency rachitis are more likely to have respiratory infections, while children who appear to be exposed to sunlight have fewer respiratory infections. [65] Adults with low vitamin D levels are more likely to report that they have recently had an infection with cough, cold or upper respiratory disease. [66] A randomized controlled trial in Japanese schoolchildren tested whether taking daily vitamin D supplements would prevent seasonal flu. [67] The experiment was followed by nearly 340 children for four months during the peak of the winter flu season. Half of the study participants received pills containing 1,200 I.E. vitamin D; the other half received placebo pills. The researchers found that type A influenza rates in the vitamin D group were about 40% lower than in the placebo group; there was no significant difference in type B influenza rates. Although randomized controlled trials that examine the potential of vitamin D to prevent other acute respiratory infections have yielded mixed results, a large meta-analysis of each participant's data found that daily or weekly vitamin D supplementation lowers the risk of acute respiratory infections. [68] This effect was particularly noticeable in very poor individuals. The results of this large meta-analysis have increased the possibility that low vitamin D levels may also increase the risk or severity of a novel coronavirus infection in 2019 (COVID-19). Although there is no direct evidence on this topic because of this such new disease, avoiding low levels of vitamin D makes sense for this and other reasons. So if there is reason to believe that levels could be low, such as with darker skin or limited sunlight, taking a supplement of 1000 or 2000 IU per day is appropriate. This amount is now part of many standard multiple vitamin supplements and inexpensive. Further research is needed before we can definitively say that vitamin D protects against flu and other acute respiratory infections. Even if vitamin D has some benefit, don't skip your flu shot. And when it comes to limiting the risk of COVID-19, it is important to practice careful social disengagement and hand washing. Tuberculosis Before the advent of antibiotics, sunlight and sun lamps were part of the standard treatment for tuberculosis (TB). [69] Recent research suggests that the sunshine vitamin may be associated with TB risk. Several case-control studies, when analysed together, suggest that people in whom has been diagnosed to have lower vitamin D levels than healthy people with similar ages and other traits. [70] Such studies do not follow individuals over time, so they cannot tell us whether vitamin D deficiency has led to the increased risk of TB or whether taking vitamin D supplements would prevent TB. There are also genetic differences in the receptor receptor vitamin D, and these differences can affect TB risk. [71] More research is needed here, too. Risk of Premature Death A promising report in the Archive of Internal Medicine suggests that taking vitamin D supplements may lower the overall mortality rate: A combined analysis of several studies found that taking modest amounts of vitamin D supplements was associated with a statistically significant 7% reduction in mortality for some reason. [72] The analysis examined the results of 18 randomised controlled trials involving a total of almost 60,000 study participants; Most study participants took an average of between 400 and 800 I.E. vitamin D per day for an average of five years. Keep in mind that this analysis has several limitations, especially the fact that the studies it included were not intended to investigate mortality in general or to investigate specific causes of death. A recent meta-analysis suggests that this reduction in mortality is mainly due to a reduction in cancer mortality. [38] Further research is needed before general information on vitamin D and mortality can be provided. [73] Food sources Few foods are naturally rich in vitamin D3. The best sources are the meat of fatty fish and fishliver oils. Smaller amounts are found in egg yolks, cheese and beef liver. Certain mushrooms contain some vitamin D2; In addition, some commercially sold mushrooms contain higher amounts of D2 because they are deliberately exposed to high amounts of ultraviolet light. Many foods and supplements are enriched with vitamin D such as dairy products and cereals. Cod liver oil salmon swordfish tuna fish orange juice enriched with vitamin D milk and plant milk enriched with vitamin D sardines beef liver egg yolk enriched cereals if you buy vitamin D supplements, you can see two different forms: vitamin D2 and vitamin D3. Vitamin D2 is made from plants and is found in fortified foods and some dietary supplements. Vitamin D3 is naturally produced in the human body and is found in animal foods. There is an ongoing debate about whether vitamin D3 cholecalciferol is better than vitamin D2 ergocalciferol in increasing the blood levels of the vitamin. A meta-analysis of randomized controlled trials comparing the effects of vitamin D2 and D3 supplements on blood levels found that D3 supplements tended to increase the blood concentrations of the vitamin more and kept these levels longer than D2. [74.75] Some experts cite vitamin D3 as the preferred form, as it is naturally produced in the body and is found in most foods that are contain the vitamin. Ultraviolet light vitamin D3 can be formed when a chemical reaction occurs in human skin when a steroid called 7-dehydrocholesterol is broken down by the sun's UVB light or so-called tanning rays. The amount of vitamin absorbed can vary greatly. The following conditions that reduce exposure to UVB light and thus reduce vitamin D absorption: use of sunscreen; Properly applied sunscreen can reduce vitamin D by more than 90%. [76] Wear full clothing that covers the skin. Spend limited time outdoors. Darker skin tones due to higher amounts of the pigment melanin, which acts as a kind of natural sun protection. [77] Older restraining when there is a decrease in 7-dehydrocholesterol levels and changes in the skin, and a population that is likely to spend more time indoors. Certain seasons and life in northern latitudes graded above the equator, where UVB light is weaker. [76] In the northern hemisphere, people living in Boston (USA), Edmonton (Canada) and Bergen (Norway) cannot make enough vitamin D from the sun for 4, 5 and 6 months of the year. [76] In the southern hemisphere, the inhabitants of Buenos Aires (Argentina) and Cape Town (South Africa) take far less vitamin D from the sun in the winter months (June to August) than in the spring and summer months. [76] The body stores vitamin D from the summer sun, but must last many months. Until late winter, many people in these higher-skilled areas are deficient. [77] Note that it is important to avoid excessive sunlight, as UV rays can cause skin cancer, and in general, no solariums should be used. Signs of deficiency and toxicity deficiency vitamin D deficiency can occur due to a deficiency in the diet, poor absorption, or with a metabolic need for higher amounts. If you don't eat enough vitamin D and don't get enough ULTRAVIOLET sunlight over a long period of time (see section above), you may experience a deficiency. People who do not tolerate or eat milk, eggs and fish, such as people with lactose intolerance or a vegan diet, have a higher risk of deficiency. Other people at high risk for vitamin D deficiency are: people with inflammatory bowel disease (ulcerative colitis, Crohn's disease) or other conditions that interfere with the normal digestion of fat. Vitamin D is a fat-soluble vitamin that depends on the gut's ability to absorb food fat. People who are obese tend to have lower levels of vitamin D in their blood. Vitamin D accumulates in excess adipose tissue, but is not readily available for use by the body if necessary. Higher doses of vitamin D supplementation may be required to achieve a desirable blood level. Conversely, vitamin D levels in the blood increase as obese people lose weight. People who have undergone gastric bypass surgery, which usually removes the upper part of the small intestine where vitamin D is absorbed. Diseases due to a prolonged vitamin D deficiency: Rickets: A condition in infants and children of soft bones and skeletal deformities caused by the failure of bone tissue to harden. Osteomalacia: A condition in weak and softened bones that can be reversed with supplementation. This is different from osteoporosis, where the bones are porous and brittle and the condition is irreversible. Toxicity vitamin D toxicity most commonly occurs from taking dietary supplements. The small amounts of vitamins found it is unlikely that foods will reach toxic levels, and high sun exposure does not lead to toxicity, as excess heat on the skin prevents the formation of D3. It is recommended not to take any daily vitamin D supplements with more than 4,000 I.E., unless monitored under the supervision of your doctor. Symptoms of toxicity: Anorexia weight loss Irregular heartbeat hardening of blood vessels and tissues due to increased calcium levels in the blood, which may lead to damage to the heart and kidneys, did you know? Capturing the sun's rays in a sunny office or driving in a car does not help to obtain vitamin D, as window glass completely blocks UVB ultraviolet light. 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