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Think you may have COVID-19? Find out where you can get tested Need a vaccine or booster? Schedule today Coming to a Cleveland Clinic location? Visitation and mask requirements Getting enough, but not too much, vitamin D is needed to keep your body functioning well. Vitamin D helps with strong bones and may help prevent some cancers. Symptoms of vitamin D deficiency can include muscle weakness, pain, fatigue and depression. To get enough D, look to certain foods, supplements, and carefully planned sunlight. Vitamin D Deficiency Symptoms of vitamin D deficiency Vitamin D deficiency means that you do not have enough vitamin D in your body. Vitamin D is unique because your skin actually produces it by using sunlight. Fair-skinned individuals and those who are younger convert sunshine into vitamin D far better than those who are darker-skinned and over age 50. Why is vitamin D so important? Vitamin D is one of many vitamins our bodies need to stay healthy. This vitamin has many functions, including: Keeping bones strong: Having healthy bones protects you from various conditions, including rickets. Rickets is a disorder that causes children to have bones that are weak and soft. It is caused by a lack of vitamin D in the body. You need vitamin D so that calcium and phosphorus can be used to build bones. In adults, having soft bones is a condition called osteomalacia. Absorbing calcium: Vitamin D, along with calcium, helps build bones and keep bones strong and healthy. Weak bones can lead to osteoporosis, the loss of bone density, which can lead to fractures. Vitamin D, once either taken orally or from sunshine exposure is then converted to an active form of the vitamin. It is that active form that promotes optimal absorption of calcium from your diet. Working with parathyroid glands: The parathyroid glands work minute to minute to balance the calcium in the blood by communicating with the kidneys, gut and skeleton. When there is sufficient calcium in the diet and sufficient active Vitamin D, dietary calcium is absorbed and put to good use throughout the body. If calcium intake is insufficient, or vitamin D is low, the parathyroid glands will 'borrow' calcium from the skeleton in order to keep the blood calcium in the normal range. What are the health effects of vitamin D deficiency? Getting enough vitamin D may also play a role in helping to keep you healthy by protecting against the following conditions and possibly helping to treat them. These conditions can include: What are the sources of vitamin D? You can get vitamin D in a variety of ways. These can include: Being exposed to the sun. About 15-20 minutes three days per week is usually sufficient. Through the foods you eat. Through nutritional supplements. What does sunlight have to do with getting enough vitamin D? There are health benefits of sunlight. Vitamin D is produced when your skin is exposed to sunshine, or rather, the ultraviolet B (UV-B) radiation that the sun emits. The amount of vitamin D that your skin makes depends on such factors as: The season: This factor depends a bit on where you live. In areas such as Cleveland, OH, the UV-B light does not reach the earth for six months out of the year due to the ozone layer and the zenith of the sun. The time of day: The sun's rays are most powerful between 10 a.m. and 3 p.m. The amount of cloud cover and air pollution. Where you live: Cities near the equator have higher ultraviolet (UV) light levels. It is the UV-B light in sunlight that causes your skin to make vitamin D. The melanin content of your skin: Melanin is a brown-black pigment in the eyes, hair and skin. Melanin causes skin to tan. The darker your skin, the more sun exposure is needed in order to get sufficient vitamin D from the sun. What does your diet have to do with getting enough vitamin D? Vitamin D doesn't occur naturally in many foods. That's why certain foods have added vitamin D. In fact, newer food nutrition labels show the amount of vitamin D contained in a particular food item. It may be difficult, especially for vegans or people who are lactose-intolerant, to get enough vitamin D from their diets, which is why some people may choose to take supplements. It is always important to eat a variety of healthy foods from all food groups. The vitamin content of various foods is shown in the following table. Vitamin D content of various foods FoodVitamin D content in International Units (IUs) per servingCod liver oil, 1 tablespoon1360Swordfish, cooked, 3 ounces566Salmon (sockeye) cooked, 3 ounces447Tuna, canned in water, drained, 3 ounces154Orange juice fortified with vitamin D, 1 cup137Milk, vitamin-fortified, 1 cup115-124Yogurt, fortified with 20% of the daily value of vitamin D, 6 ounces80Sardines, canned in oil, drained, 2 sardines46Liver, beef, cooked, 3 ounces42Egg yolk, 1 large41Cereal, fortified with 10% of the daily value of vitamin D, 1 cup40Cheese, Swiss, 1 ounce6 Source: Vitamin D. Health Professionals. Dietary Supplement Fact Sheet. National Institutes of Health. Office of Dietary Supplements. August 7, 2019. It is important to check product labels, as the amount of added vitamin D varies when it is artificially added to products such as orange juice, yogurt and margarine. How much vitamin D do you need? In healthy people, the amount of vitamin D needed per day varies by age. The chart below shows the often-cited recommendations of the Institute of Medicine, now the Health and Medicine Division of the National Academies of Sciences, Engineering, and Medicine. It is important to know that these are general recommendations. If your doctor is checking your blood levels, he or she might recommend higher or lower doses based on your individual needs. If you have osteoporosis, your doctor might suggest a blood test of your vitamin D levels. The amount of vitamin D supplement can be customized for each person, based on the results. For many older patients, a vitamin D supplement containing anywhere between 800 to 2000 IUs daily, which can be obtained without a prescription, can be both safe and beneficial. It is important to speak with your doctor about your individual needs. People by ageRecommended dietary allowance (IU/day)Upper level intake (IU/day)Infants 0-6 months*4001,000Infants 6-12 months*4001,500Children 1-3 years old6002,500Children 4-8 years old6003,000People 9-70 years old6004,000People over 70 years old8004,000Females 14-50 years old, pregnant/lactating6004,000 *refers to adequate intake vs recommended dietary allowance of the other age groups. Vitamin D deficiency can be caused by specific medical conditions, such as: Cystic fibrosis, Crohn's disease, and celiac disease: These diseases do not allow the intestines to absorb enough vitamin D through supplements. Weight loss surgeries. Weight loss surgeries that reduce the size of the stomach and/or bypasses part of the small intestines make it very difficult to consume sufficient quantities of certain nutrients, vitamins, and minerals. These individuals need to be carefully monitored by their doctors and need to continue to take vitamin D and other supplements throughout their lives. Obesity: A body mass index greater than 30 is associated with lower vitamin D levels. Fat cells keep vitamin D isolated so that it is not released. Vitamin D deficiency is more likely in obese people. Obesity often makes it necessary to take larger doses of vitamin D supplements in order to reach and maintain normal D levels. Kidney and liver diseases: These diseases reduce the amount of an enzyme needed to change vitamin D to a form that is used in the body. Lack of this enzyme leads to an inadequate level of active vitamin D in the body. What other factors can lead to vitamin D deficiency? Age: The skin's ability to make vitamin D lessens with age. Mobility: People who are homebound or are rarely outside (for example, people in nursing homes and other facilities) are not able to use sun exposure as a source of vitamin D. Skin color: Dark-colored skin is less able to make vitamin D than fair-colored skin. Human breast milk: A woman's breast milk only contains a small amount of vitamin D. Often infant formulas also only include a small amount of D also. Therefore infants are at risk of not receiving enough vitamin D. This is especially true for infants who are only fed breast milk. Can medications cause a vitamin D deficiency? Yes. Vitamin D levels can be lowered by certain medications. These include: Always tell your doctor about the drugs you take and any vitamin D supplements or other supplements or herbs/alternative health products that you take. What are the signs and symptoms of vitamin D deficiency? Severe lack of vitamin D causes rickets, which shows up in children as incorrect growth patterns, weakness in muscles, pain in bones and deformities in joints. This is very rare. However, children who are deficient in vitamin D can also have muscle weakness or sore and painful muscles. Lack of vitamin D is not quite as obvious in adults. Signs and symptoms might include: Fatigue. Bone pain. Muscle weakness, muscle aches, or muscle cramps. Mood changes, like depression. Your doctor can order a blood test to measure your levels of vitamin D. There are two types of tests that might be ordered, but the most common is the 25-hydroxyvitamin D, known as 25(OH)D for short. For the blood test, a technician will use a needle to take blood from a vein. You do not need to fast or otherwise prepare for this type of test. What do vitamin D test results mean? There are some differing opinions about what levels of vitamin D work the best for each person. Laboratories might use different numbers for reference. Please discuss your results with your doctor. How often do you need to get your vitamin D levels checked? Doctors do not usually order routine checks of vitamin D levels, but they might need to check your levels if you have certain medical conditions or risk factors for vitamin D deficiency. Sometimes vitamin D levels can be checked as a cause of symptoms such as long-lasting body aches, a history of falls or bone fractures without significant trauma. The goals of treatment and prevention are the same—to reach, and then maintain, an adequate level of vitamin D in the body. While you might consider eating more foods that contain vitamin D and getting a little bit of sunlight, you will likely be told to take vitamin D supplements. Vitamin D comes in two forms: D2 and D3. D2, also called ergocalciferol, comes from plants. D3, also called cholecalciferol, comes from animals. You need a prescription to get D2. D3, however, is available over the counter. It is more easily absorbed than D2 and lasts longer in the body dose-for-dose. Work with your doctor to find out if you need to take a vitamin supplement and how much to take if it is needed. Can you ever have too much vitamin D? Yes. You can get too much vitamin D if you overdo the supplements. Interestingly, you cannot get too much vitamin D from the sun. Vitamin D toxicity is, thankfully, quite rare but can lead to hypercalcemia and together the symptoms can include: Nausea. Increased thirst and urination. Poor appetite. Constipation. Weakness. Confusion. Ataxia (a neurological condition that may cause slurring of words and stumbling). Do not take higher-than-recommended doses of vitamin D without first discussing it with your doctor. However, your doctor might recommend higher doses of vitamin D if he or she is checking your blood levels and adjusting your dose accordingly. Also, be cautious about getting large doses of vitamin A along with the D in some fish oils. Vitamin A can also reach toxic levels and can cause serious problems. The goals of treating and preventing the lack of vitamin D of treatment and prevention are the same—to reach and keep an adequate level of vitamin D in the body. Your healthcare provider will let you know if you need to take or keep taking vitamin D supplements. If so, they will also let you know how much you should take. You might also want to consider: Eating more foods that contain vitamin D: See the vitamin D food sources table included in this article. Keep in mind that foods alone usually don't meet the daily recommended levels of vitamin D. Getting some exposure to sunshine—but not too much: Exactly how much sun exposure is needed isn't clear. 10 to 15 minutes of sun exposure two to three times a week to the face, arms, legs or back may be all that is needed to absorb a suitable amount of vitamin D. You might need more sun exposure (especially in early spring and late fall) if: You are older. You have a darker skin color. You live in northern climates. The use of sunscreen, and standing behind a window, prevents vitamin D from being produced in the skin. However, you should remember that too much sunshine increases the risk of skin cancer and ages the skin. That is why taking an appropriately dosed D supplement is far safer than intentionally getting routine sun exposure. Last reviewed by a Cleveland Clinic medical professional on 10/16/2019. References Fitzgerald PA, Fitzgerald P.A, Fitzgerald, Paul A.Endocrine Disorders. In: Papadakis MA, McPhee SJ, Rabow MW, Papadakis M.A., McPhee S.J., Rabow M.W. Eds. Maxine A. Papadakis, et al eds. Current Medical Diagnosis & Treatment 2019 New York, NY: McGraw-Hill. Bender DA, Bender D.A, Bender, David A.Micronutrients: Vitamins & Minerals. In: Rodwell VW, Bender DA, Botham KM, Kennelly PJ, Weil P, Rodwell VW, Bender D.A., Botham K.M., Kennelly P.J., Weil P Eds. Victor W. Rodwell, et al eds. Harper's Illustrated Biochemistry, 31e New York, NY: McGraw-Hill. National Institutes of Health Office of Dietary Supplements. Vitamin D. (Accessed 8/24/2020. Institute of Medicine. 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