VITAMIN D AFFECTS MOST TISSUES IN THE BODY pdf

1: Vitamins: MedlinePlus Medical Encyclopedia

Usually, most of the body's vitamin D is in storage, bound to either vitamin D receptors or carrier proteins. Very little "free" vitamin D is available (1, 2).

Trace minerals carry out a diverse set of tasks. Here are a few examples: Iron is best known for ferrying oxygen throughout the body. Fluoride strengthens bones and wards off tooth decay. Zinc helps blood clot, is essential for taste and smell, and bolsters the immune response. Copper helps form several enzymes, one of which assists with iron metabolism and the creation of hemoglobin, which carries oxygen in the blood. The other trace minerals perform equally vital jobs, such as helping to block damage to body cells and forming parts of key enzymes or enhancing their activity. Words to the wise Trace minerals interact with one another, sometimes in ways that can trigger imbalances. Too much of one can cause or contribute to a deficiency of another. Here are some examples: A minor overload of manganese can exacerbate iron deficiency. Having too little can also cause problems. When the body has too little iodine, thyroid hormone production slows, causing sluggishness and weight gain as well as other health concerns. The problem worsens if the body also has too little selenium. A closer look at antioxidants Antioxidant is a catchall term for any compound that can counteract unstable molecules such as free radicals that damage DNA, cell membranes, and other parts of cells. Your body cells naturally produce plenty of antioxidants to put on patrol. The foods you eatâ€”and, perhaps, some of the supplements you takeâ€”are another source of antioxidant compounds. Carotenoids such as lycopene in tomatoes and lutein in kale and flavonoids such as anthocyanins in blueberries, quercetin in apples and onions, and catechins in green tea are antioxidants. The vitamins C and E and the mineral selenium also have antioxidant properties. Why free radicals may be harmful Free radicals are a natural byproduct of energy metabolism and are also generated by ultraviolet rays, tobacco smoke, and air pollution. They lack a full complement of electrons, which makes them unstable, so they steal electrons from other molecules, damaging those molecules in the process. Free radicals have a well-deserved reputation for causing cellular damage. But they can be helpful, too. When immune system cells muster to fight intruders, the oxygen they use spins off an army of free radicals that destroys viruses, bacteria, and damaged body cells in an oxidative burst. Vitamin C can then disarm the free radicals. How antioxidants may help Antioxidants are able to neutralize marauders such as free radicals by giving up some of their own electrons. When a vitamin C or E molecule makes this sacrifice, it may allow a crucial protein, gene, or cell membrane to escape damage. This helps break a chain reaction that can affect many other cells. Each of the nutrients that has antioxidant properties also has numerous other aspects and should be considered individually. The context is also importantâ€”in some settings, for example, vitamin C is an antioxidant, and in others it can be a pro-oxidant. Words to the wise Articles and advertisements have touted antioxidants as a way to help slow aging, fend off heart disease, improve flagging vision, and curb cancer. And laboratory studies and many large-scale observational trials the type that query people about their eating habits and supplement use and then track their disease patterns have noted benefits from diets rich in certain antioxidants and, in some cases, from antioxidant supplements. But results from randomized controlled trials in which people are assigned to take specific nutrients or a placebo have failed to back up many of these claims. One study that pooled results from 68 randomized trials with over , participants found that people who were given vitamin E, beta carotene, and vitamin A had a higher risk of death than those who took a placebo. There appeared to be no effect from vitamin C pills and a small reduction in mortality from selenium, but further research on these nutrients is needed. These findings suggest little overall benefit of the antioxidants in pill form. On the other hand, many studies show that people who consume higher levels of these antioxidants in food have a lower risk of many diseases. Eating a healthy diet is the best way to get your antioxidants. Adapted with permission from Making Sense of Vitamins and Minerals: Choosing the foods and nutrients you need to stay healthy , a special health report published by Harvard Health Publications. This site is for information only and NOT a substitute for professional diagnosis and treatment. We depend on support from our readers. All donations help and are greatly appreciated.

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2: Fat-Soluble Vitamins: A, D, E, and K - - ExtensionExtension

Vitamin D is required for the regulation of the minerals calcium and phosphorus found in the body. It also plays an important role in maintaining proper bone structure. Sun exposure is an easy.

Vitamin D and your health: Breaking old rules, raising new hopes Published: February, Vitamin D was discovered in , culminating the long search for a way to cure rickets, a painful childhood bone disease. Within a decade, the fortification of foods with vitamin D was under way, and rickets became rare in the United States. But solving the problem of rickets was only the beginning of research into vitamin D. Results suggest that vitamin D may have an important role in many aspects of human health, from bone fractures to prostate cancer, cardiovascular disease, neuromuscular problems, and diabetes. Breaking the old rules Vitamin D is one of the 13 vitamins discovered in the early 20th century by doctors studying nutritional deficiency diseases. Although vitamin D is firmly enshrined as one of the four fat-soluble vitamins, it is not technically a vitamin. As our habits change, most of us cannot rely on our bodies to produce vitamin D the old-fashioned way. Instead, we increasingly depend on artificially fortified foods and pills to provide this vital nutrient. Coming full circle in the modern world, this substance may actually come to fit the technical definition of a vitamin. What is vitamin D? Vitamin D is not one chemical but many. The natural type is produced in the skin from a universally present form of cholesterol, 7-dehydrocholesterol. Sunlight is the key: In contrast, most dietary supplements are manufactured by exposing a plant sterol to ultraviolet energy, thus producing vitamin D2. Because their function is almost identical, D2 and D3 are lumped together under the name vitamin D "" but neither will function until the body works its magic see figure. The first stop is in the liver, where vitamin D picks up extra oxygen and hydrogen molecules to become hydroxyvitamin D, or 25 OH D. This is the chemical that doctors should measure to diagnose vitamin D deficiencies. There it acquires a final pair of oxygen and hydrogen molecules to become 1,25 dihydroxyvitamin D; scientists know this active form of the vitamin as 1,25 OH 2D, or calcitriol, but for ordinary folks the name vitamin D is accurate enough. A lack of vitamin D in children causes rickets; in adults, it causes osteomalacia. Both bone diseases are now rare in the United States, but another is on the rise "" osteoporosis, the "thin bone" disease that leads to fractures and spinal deformities. Low levels of vitamin D lead to low bone calcium stores, increasing the risk of fractures. If vitamin D did nothing more than protect bones, it would still be essential. But researchers have begun to accumulate evidence that it may do much more. In the intestines, the receptors capture vitamin D, enabling efficient calcium absorption. But similar receptors are also present in many other organs, from the prostate to the heart, blood vessels, muscles, and endocrine glands. And work in progress suggests that good things happen when vitamin D binds to these receptors. Vitamin D deficiencies Vitamin D deficiencies were rare when most men rolled up their sleeves to work in sunny fields. But as work shifted from farms to offices, that changed. Deficiencies are also common in patients with intestinal disorders that limit absorption of fat and those with kidney or liver diseases that reduce the conversion of vitamin D to its active form, calcitriol 1,25 OH 2D. In addition, certain medications reduce the availability or activity of vitamin D. And even in healthy people, advancing age is linked to an increased risk of vitamin D deficiency. A number of factors can play a role. Limited exposure to sunlight heads the list. The same is true for people who spend most of their time indoors and for those of us who avoid sunshine and use sunscreens to protect our skin from the harmful effects of ultraviolet radiation see box below. Sunscreens Like politicians, doctors often have to compromise; when it comes to sunshine, most pols promise blue skies, while most docs turn out to be the shady guys "" or, at least, sunscreen advocates. UVB provides the energy your skin needs to make vitamin D, but that energy can burn the skin and increase the cell damage that leads to cancer. UVA also contributes to skin damage and premature aging. To protect yourself, avoid the summer sunshine, especially between 10 a. Whenever possible, wear a large-brimmed hat and a tightly woven, dark-colored long-sleeve shirt and long pants when you go out in the sun. But summer garb is usually lightweight and exposes a lot of skin. Look for a product with an SPF of at least 15; fair-skinned people would be wise to shoot for 30 or higher. But since SPFs apply only to UVB, look for a "broad spectrum" sunscreen that also protects against UVA; most contain titanium dioxide, zinc oxide, or

avobenzone also known as Parsol Above all, apply your sunscreen early, often, and liberally. These many factors explain why vitamin D deficiencies are shockingly common in the United States. And low levels of vitamin D are common even in apparently healthy young adults; in one study, more than a third of people between the ages of 18 and 29 were deficient. Numbers can never tell the whole story, but in this case, "D-ficiencies" add up to a wide range of health concerns. Skeletal health is the best-known contribution of vitamin D, but it has also become the most controversial. Although doctors agree that vitamin D deficiency increases the risk of osteoporosis and fractures, they disagree about the benefits and optimal dosage of supplements. Without enough vitamin D, the intestines cannot efficiently absorb calcium. But because blood calcium is critical for neuromuscular and cardiac function, the body does not allow levels to fall. Instead, it pours out parathyroid hormone, which mobilizes calcium from bone. Blood calcium levels remain normal, so your heart and nerves keep working nicely. But your bones bear the brunt: As bone calcium density falls, bones become weak and fracture-prone. Most studies show that a lack of vitamin D increases the risk of osteoporosis and the likelihood of hip and other nonspinal fractures. But there is considerable disagreement about how much supplements reduce the risk of fractures. Some studies include only women, others both men and women; some include only frail, elderly, or institutionalized subjects, others physically active people; some use vitamin D alone, others a combination of D and varying doses of calcium; and some administer international units IU of vitamin D a day, others up to IU a day. In contrast, supplements of IU a day, the conventional dose, had no benefit. Most authorities agree that high doses of vitamin D supplements appear to protect against fractures and low doses do not. But two trials that found no benefit from IU a day were completed after the meta-analysis, ensuring that the proper dose will remain a bone of contention. Vitamin D has an important role in regulating cell growth. Laboratory experiments suggest that it helps prevent the unrestrained cell multiplication that characterizes cancer by reducing cell division, restricting tumor blood supply angiogenesis , increasing the death of cancer cells apoptosis , and limiting the spread of cancer cells metastasis. Like many human tissues, the prostate has an abundant supply of vitamin D receptors. And, like some other tissues, it also contains enzymes that convert biologically inactive 25 OH D into the active form of the vitamin, 1,25 OH 2D. These enzymes are much more active in normal prostate cells than in prostate cancer cells. Do the results from these experiments translate into clinically important effects? Several lines of evidence are relevant. First, the calcium connection. Since then, other studies have confirmed a link between very high levels of dietary calcium and increased risk, but they have exonerated modest calcium consumption. The Harvard scientists speculate that the problem is not calcium itself but a relative lack of active vitamin D. Second, the sunlight connection. Of course, sunlight is just one of the many differences between these groups of men, and various genetic, dietary, lifestyle, and health care disparities could account for the prostate cancer gap. Indeed, early studies failed to demonstrate a clear association between blood levels of 25 OH D and prostate cancer. And certain genetic variations in the vitamin D receptor appeared to enhance the protective effect of the vitamin. Can vitamin D reduce your risk of prostate cancer? Other malignancies The risk of colon cancer, breast cancer, and other malignancies appears to rise in populations at latitudes far from the equator. Sun exposure and vitamin D levels may be part of the explanation. As in the case of prostate cancer, the details vary from study to study. Still, a review concluded that the overall pattern suggests benefit, especially for colon cancer. And even more recent research suggests that vitamin D may have a role in reducing the risk of cancer of the pancreas and kidney. Observational studies and sophisticated calculations are important, but they can be overturned by the results of randomized clinical trials. Indeed, in a major seven-year trial of IU of vitamin D and 1, mg of calcium a day found no protection against colon cancer in women. Dashed hopes for beta carotene and vitamin E also remind us that caution and patience are the watchwords for supplements "" and the conflicting results from randomized trials examining the relationship between vitamin D and fractures remind us that even clinical trials can pose therapeutic "D-lemmas. Osteoporosis increases the risk of fractures. Falling also breaks bones, and vitamin D can help with both brittle bones and falls. The benefit was greatest in older, less active women; the possible gender difference may be explained by differences in physical activity, muscle size, or diet. Since vitamin D binds to receptors in muscles, the improvements in strength and balance may account for the benefit. Vitamin D deficiency has been linked to persistent and

otherwise unexplained muscle and bone pain, and some patients have been helped by supplements. Several observational studies have linked a high consumption of vitamin D with a reduced risk of multiple sclerosis. Vitamin D may play an important role in vascular health. Osteoporosis is associated with an increased risk of coronary artery disease, and low blood levels of vitamin D have been linked to increased coronary artery calcification. Although animal studies suggest that vitamin D has a role in regulating blood pressure, a Harvard analysis found no link between the consumption of vitamin D and human hypertension. Still, low levels of the vitamin appear related to an increased risk of stroke and congestive heart failure; and a study found that supplements reduce inflammation in patients with congestive heart failure. Although experiments show that vitamin D can protect animals from diabetes, human studies are less convincing. Using data from the Framingham Heart Study, researchers found that high levels of vitamin D were associated with a reduced risk of arthritis of the knee. High levels have also been linked to better lung function, a stronger immune system, and an enhanced ability to fight off certain infections, such as tuberculosis. All these potential benefits require additional study, but vitamin D ointments have already been approved to treat psoriasis.

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3: 9 things that can undermine your vitamin D level - Harvard Health

Vitamin D is a fat-soluble vitamin that is naturally present in very few foods, added to others, and available as a dietary supplement. It is also produced endogenously when ultraviolet rays from sunlight strike the skin and trigger vitamin D synthesis. Vitamin D obtained from sun exposure, food.

Folate folic acid and B9 Vitamins are grouped into two categories: The four fat-soluble vitamins are vitamins A, D, E, and K. These vitamins are absorbed more easily by the body in the presence of dietary fat. There are nine water-soluble vitamins. The body must use water-soluble vitamins right away. Any leftover water-soluble vitamins leave the body through the urine. Vitamin B12 is the only water-soluble vitamin that can be stored in the liver for many years. Function Each of the vitamins listed below has an important job in the body. A vitamin deficiency occurs when you do not get enough of a certain vitamin. Vitamin deficiency can cause health problems. Not eating enough fruits, vegetables, beans, lentils, whole grains and fortified dairy foods may increase your risk for health problems, including heart disease, cancer, and poor bone health osteoporosis. Vitamin A helps form and maintain healthy teeth, bones, soft tissue, mucus membranes, and skin. Vitamin B6 is also called pyridoxine. Vitamin B6 helps form red blood cells and maintain brain function. This vitamin also plays an important role in the proteins that are part of many chemical reactions in the body. The more protein you eat the more pyridoxine your body requires. Vitamin B12 , like the other B vitamins, is important for metabolism. It also helps form red blood cells and maintain the central nervous system. Vitamin C , also called ascorbic acid, is an antioxidant that promotes healthy teeth and gums. It helps the body absorb iron and maintain healthy tissue. It also promotes wound healing. Vitamin D is also known as the "sunshine vitamin," since it is made by the body after being in the sun. People who do not live in sunny places may not make enough vitamin D. It is very hard to get enough vitamin D from food sources alone. Vitamin D helps the body absorb calcium. You need calcium for the normal development and maintenance of healthy teeth and bones. It also helps maintain proper blood levels of calcium and phosphorus. Vitamin E is an antioxidant also known as tocopherol. It helps the body form red blood cells and use vitamin K. Vitamin K is needed because without it, blood would not stick together coagulate. Some studies suggest that it is important for bone health. Biotin is essential for the metabolism of proteins and carbohydrates, and in the production of hormones and cholesterol. Niacin is a B vitamin that helps maintain healthy skin and nerves. It also has cholesterol-lowering effects at higher doses. Folate works with vitamin B12 to help form red blood cells. It is needed for the production of DNA, which controls tissue growth and cell function. Any woman who is pregnant should be sure to get enough folate. Low levels of folate are linked to birth defects such as spina bifida. Many foods are now fortified with folic acid. Pantothenic acid is essential for the metabolism of food. It also plays a role in the production of hormones and cholesterol. Riboflavin vitamin B2 works with the other B vitamins. It is important for body growth and the production of red blood cells. Thiamine vitamin B1 helps the body cells change carbohydrates into energy. Getting enough carbohydrates is very important during pregnancy and breastfeeding. It is also essential for heart function and healthy nerve cells.

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4: Overview of Vitamin D - Dietary Reference Intakes for Calcium and Vitamin D - NCBI Bookshelf

Most people think of vitamin D as the "bone vitamin," but recent discoveries show that vitamin D is essential for a tremendous number of normal body processes. Virtually every tissue type in the body possesses receptors for the activated vitamin D molecule, defining it as a true hormone.

This is because it is a critical component of the rhodopsin molecule, which is activated when light shines on the retina, sending a signal to the brain that results in vision. Supports Immunity Vitamin A plays an integral role in immune health and may be especially beneficial for warding off illness and infections. According to a review out of Baltimore, a deficiency in this key vitamin can weaken immunity and even alter the function of immune cells. Relieves Inflammation Beta-carotene acts as a powerful antioxidant in the body, helping reduce the buildup of harmful free radicals and prevent oxidative damage to cells while also blocking inflammation. The anti-inflammatory effects of vitamin A and beta-carotene can have far-reaching effects on many aspects of health, as inflammation is at the root of many chronic conditions, ranging from cancer to heart disease and diabetes. Keeps Skin Glowing Often prescribed by dermatologists to fight acne and wrinkles alike, vitamin A is revered for its potent skin-enhancing properties. In fact, studies show that retinoids may be therapeutic for common skin conditions like psoriasis, eczema and acne. Contains Cancer-Fighting Properties With the growing body of research demonstrating a strong link between what you eat and your risk of cancer, it should come as no surprise that upping your intakes of vitamin A foods could help protect against cancer development. According to a review published in BioMed Research International, retinoids have been shown to block the growth of skin, bladder, breast, prostate and lung cancer cells in in vitro studies. Boosts Bone Health Most of us are well aware of the connection between bone health and nutrients like calcium and vitamin D, but did you know that vitamin A is also a crucial component of bone growth as well? Hitting just the right balance of vitamin A is essential, however, as both an excess and deficiency in this important vitamin have been linked to compromised bone health. The results also showed that low levels of retinol were associated with reduced bone mineral density in the femur. Reduces Cholesterol Cholesterol is a waxy, fat-like substance found throughout the body. Too much cholesterol, however, can build up in your blood vessels, causing them to harden and narrow, increasing the risk of heart disease. Although human studies are limited, some research shows that getting enough vitamin A in your diet may help naturally lower cholesterol levels to optimize heart health. An animal model out of Brazil, for instance, found that supplementing rats with beta-carotene for six weeks was able to significantly slash levels of total cholesterol in the blood. A deficiency in this key vitamin is linked to depressed immune function, a higher morbidity and mortality, and even a greater risk of mother-to-child transmission of HIV-1 for pregnant women. Beta-carotene is also considered critical in the prevention of developmental disorders for women who are pregnant or breastfeeding. Promotes Tissue Repair When it comes to tissue repair and cell regeneration, getting enough vitamin A in your diet is key. Besides being vital to promoting proper skin health, some evidence even suggests that this vitamin could aid in wound healing as well. Urinary stones generally form in the kidneys and then slowly grow and develop in the ureters or bladder. They can cause symptoms like frequent urination, abdominal pain, discomfort and hematuria bloody urine. Left untreated, they can also cause infections and complications and may even require surgical intervention in some cases. Some research shows that vitamin A may aid in the prevention of urinary stones. Vitamin A Deficiency Symptoms Vitamin A is essential for normal vision as well as proper bone growth, healthy skin, and protection of the mucous membranes of the digestive, respiratory and urinary tracts against infection. People with long-term malabsorption of fats are more susceptible to developing a vitamin A deficiency. Those with leaky gut syndrome , celiac disease, autoimmune disorders, inflammatory bowel disease, pancreatic disorders or alcohol dependence are also at a higher risk of deficiency. Vitamin A deficiency has become a public health problem in more than half of all countries, especially in Africa and Southeast Asia, and affects many young children and pregnant women in low-income countries in particular. This can be a serious problem for children because the lack of vitamin A causes severe visual impairment and blindness and also significantly increases the risk of serious illness, such as infectious diarrhea and measles.

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Some of the most common symptoms of a vitamin A deficiency include:

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5: Vitamins & Minerals: Are You Getting What You Need?

Maintenance of epithelial tissues (accounts for most of the body's need for this vitamin), Promoting vision by the synthesis of a visual pigment, helps with Sperm development in men and normal fetal development in women, Growth of bones and teeth.

A unique aspect of vitamin D as a nutrient is that it can be synthesized by the human body through the action of sunlight. These dual sources of vitamin D make it challenging to develop dietary reference intake values. Vitamin D , also known as calciferol, comprises a group of fat-soluble seco-sterols. The two major forms are vitamin D2 and vitamin D3. Vitamin D2 ergocalciferol is largely human-made and added to foods, whereas vitamin D3 cholecalciferol is synthesized in the skin of humans from 7-dehydrocholesterol and is also consumed in the diet via the intake of animal-based foods. Both vitamin D3 and vitamin D2 are synthesized commercially and found in dietary supplements or fortified foods. The D2 and D3 forms differ only in their side chain structure. The differences do not affect metabolism i. When activated, the D2 and D3 forms have been reported to exhibit identical responses in the body, and the potency related to the ability to cure vitamin Dâ€”deficiency rickets is the same Fieser and Fieser, ; Jones et al. Experimental animal studies have indicated that vitamin D2 is less toxic than vitamin D3, but this has not been demonstrated in humans. The activation steps involved in converting vitamin D from the diet and cutaneous synthesis are illustrated in Figure Vitamin D , in either the D2 or D3 form, is considered biologically inactive until it undergoes two enzymatic hydroxylation reactions. DBP also transports vitamin D and calcitriol. The renal synthesis of calcitriol is tightly regulated by two counter-acting hormones, with up-regulation via parathyroid hormone PTH and down-regulation via fibroblast-like growth factor FGF23 Galitzer et al. Low serum phosphorus levels stimulate calcitriol synthesis, whereas high serum phosphorus levels inhibit it. Following its synthesis in the kidney, calcitriol binds to DBP to be transported to target organs. The biological actions of calcitriol, involve regulation of gene expression at the transcriptional level, and are mediated through binding to a vitamin D receptor VDR , located primarily in the nuclei of target cells Jones et al. Additional hydroxylation reactions, such as that mediated by CYP24A1, as shown in Figure , result in more polar metabolites with greatly reduced or no apparent biological activity. The classical actions of vitamin Dâ€”which by itself is inactiveâ€”are due to the functions of the active metabolite, calcitriol. These actions take the form of the regulation of serum calcium and phosphate homeostasis and, in turn, the development and maintenance of bone health DeLuca, ; Reichel et al. Non-classical functions are less well elucidated. VDRs are found fairly ubiquitously throughout the body in tissues not involved with calcium and phosphate homeostasis, and the presence of VDRs in these tissues implies that calcitriol may play a more general role or that ligands other than calcitriol can activate the VDR. Furthermore, the specific vitamin Dâ€”responsive elements VDREs , considered the hallmark of vitamin D action, are present in a large number of human genes involved in a wide range of classical and non-classical roles, such as the regulation of cell proliferation, cell differentiation, and apoptosis. It has been suggested that calcitriol exerts immunomodulatory and anti-proliferative effects through autocrine and paracrine pathways Adams and Hewison, These wide-ranging actions of calcitriol have further been hypothesized to play a potential role in preventive or therapeutic action in cancer Masuda and Jones, and chronic conditions such as auto-immune conditions including type 1 diabetes , cardiovascular disease, and infections Holick et al. Outside of the biological forms of vitamin D, a number of analogues based on the vitamin D structure have been synthesized for use as potential pharmacological agents. These are not, however, dietary or biosynthesized compounds; rather, they are designed for specific applications in research or clinical treatment. Examples of synthetic analogues that have gained importance in clinical medicine are briefly mentioned below. The term vitamin D is generally used in this report to refer to both the D2 and D3 forms as well as their metabolites, although the two forms are distinguished when necessary for clarification see Box for definitions. There are a few naturally occurring food sources of vitamin D. These include fatty fish, fish liver oil, and egg yolk. Some foods are, however, fortified with vitamin D. After vitamin D was recognized as important for the prevention of rickets in the s Steenbock and Black, , vitamin D fortification of

some foods was initiated on a voluntary basis. In Canada, under the Food and Drug Regulation, 1 fortification of fluid milk and margarine with vitamin D is mandatory. In addition, fortified plant-based beverages must contain vitamin D in an amount equivalent to fluid milk. In analyses conducted in the s and early s, a significant portion of milk samples in the United States were found to contain less than the specified amount of vitamin D Tanner et al. A more recent report on vitamin Dâ€"fortified milk sampled in New York State over a period of 4 years showed that an average of only However, recent surveys from the U. In Canada, Faulkner et al. Samples collected by the Canadian Food Inspection Agency from through and analyzed for vitamin D indicated that during the last 4 years of sample collection, 47 to 69 percent were within the range specified by regulation personal communication, S. Brooks, Health Canada, April 30, In addition, over the past 5 years, the average vitamin D content of analyzed milk samples fell within this range. Over time, manufacturers in the United States have added vitamin D to other foods, and the food industry is increasingly marketing foods fortified with vitamin D Yetley, Based on data from a U. Food and Drug Administration FDA survey that provides information on the labels of processed, packaged food products in the United States, Yetley reported that almost all fluid milks, approximately 75 percent of ready-to-eat breakfast cereals, slightly more than half of all milk substitutes, approximately one-quarter of yogurts, and approximately 8 to 14 percent of cheeses, juices, and spreads are fortified with vitamin D in the U. Many product labels included in the survey indicated that the form of added vitamin D was vitamin D3. However, some milk substitutes are fortified with vitamin D2 Cereal labels did not specify the form of added vitamin D. Levels of vitamin D ranged from 40 IU per regulatory serving for cereals and cheeses to 60 IU per regulatory serving for spreads and IU per regulatory serving for fluid milk. Several food categories had within-category ranges of 40 to IU of vitamin D per regulatory serving. In Canada, infant formula is required by regulation to contain between 40 and 80 IU of vitamin D per kcal. In recent years, dietary supplements containing vitamin D have become more common and have been more frequently consumed. The form of vitamin D used in supplement products can be either vitamin D2 or vitamin D3. It would appear from informal observations of the market place that manufacturers are increasingly switching from vitamin D2 to vitamin D3, and some are increasing the vitamin D content of their products. Traditionally, many marketed dietary supplements have contained IU per daily dose, but levels in supplements have been increasing. In Canada, dosage levels of vitamin D above 1, IU are obtainable only with a prescription. Information about current national survey estimates of the intake of vitamin D from foods and supplements can be found in Chapter 7. Synthesis in the Skin Vitamin D3 is synthesized in human skin from 7-dehydrocholesterol following exposure to ultraviolet B UVB radiation with wavelength to nm. Reprinted with permission from the American Journal of Clinical Nutrition , more The production of vitamin D3 in skin is a function of the amount of UVB radiation reaching the dermis as well as the availability of 7-dehydrocholesterol Holick, Age is also a factor, in that synthesis of vitamin D declines with increasing age, due in part to a fall in 7-dehydrocholesterol levels and due in part to alterations in skin morphology MacLaughlin and Holick, Toxic levels of vitamin D do not occur from prolonged sun exposure. Thermal activation of previtamin D3 in the skin gives rise to multiple nonâ€"vitamin D forms, such as lumisterol, tachysterol and others Holick et al. Vitamin D3 can also be converted to nonactive forms. The absolute percentage of circulating 25OHD that arises from cutaneous synthesis versus oral intake of vitamin D in the free-living North American population cannot be clearly specified. This topic is further explored in the section below that focuses on serum 25OHD. The efficient absorption of vitamin D is dependent upon the presence of fat in the lumen, which triggers the release of bile acids and pancreatic lipase Weber, , In turn, bile acids initiate the emulsification of lipids, pancreatic lipase hydrolyzes the triglycerides into monoglycerides and free fatty acids, and bile acids support the formation of lipid-containing micelles, which diffuse into enterocytes. Early studies demonstrated that radiolabeled vitamin D3 appeared almost exclusively in the lymphatics and in the chylomicron fraction of plasma; as well, subjects with impaired bile acid release or pancreatic insufficiency both demonstrated significantly reduced absorption of vitamin D Thompson et al. Subsequently, other clinical and experimental animal studies confirmed that vitamin D is most efficiently absorbed when consumed with foods containing fat Weber, ; Johnson et al. The optimal amount of fat required for maximal absorption of vitamin D has not been determined. Within the intestinal wall, vitamin D,

cholesterol, triglycerides, lipoproteins, and other lipids are packaged together into chylomicrons. Importantly, while a fraction of newly absorbed intestinal vitamin D is also transported along with amino acids and carbohydrates into the portal system to reach the liver directly, the main pathway of vitamin D uptake is incorporation into chylomicrons that reach the systemic circulation via the lymphatics. Chylomicron lipids are metabolized in peripheral tissues that express lipoprotein lipase, but particularly in adipose tissue and skeletal muscle, which are rich in this enzyme. During hydrolysis of the chylomicron triglycerides, a fraction of the vitamin D contained in the chylomicron can be taken up by these tissues. Uptake into adipose tissue and skeletal muscle accounts for the rapid postprandial disappearance of vitamin D from plasma and probably also explains why increased adiposity causes sequestering of vitamin D and is associated with lower 25OHD levels Jones, What remains of the original chylomicron after lipolysis is a chylomicron remnant, a cholesterol-enriched, triglyceride-depleted particle that still contains a fraction of its vitamin D content. Metabolism to the Active Hormonal Form Vitamin D , regardless of origin, is an inactive prohormone and must first be metabolized to its hormonal form before it can function. Once vitamin D enters the circulation from the skin or from the lymph, it is cleared by the liver or storage tissues within a few hours. The processes that follow are illustrated in Figure The crystal structure of CYP2R1 has been determined with vitamin D in the active site, and the enzyme has been shown to metabolize both vitamin D2 and vitamin D3 equally efficiently Strushkevich et al. There is little, if any, feedback regulation of this enzyme. A large genome-wide association study of factors that might be determinants of the circulating 25OHD levels identified the human chromosomal 11p15 locus of CYP2R1 as a significant determinant, whereas the loci of the other enzymes purported to have hydroxylase activity e. Increasing intake of vitamin D results in higher blood levels of 25OHD, although perhaps not in a linear manner Stamp et al. The process is the same for vitamin D2 once it enters the circulation. This metabolic step is very tightly regulated by blood calcium and phosphate levels through PTH and the phosphaturic hormone, FGF23 , and constitutes the basis of the vitamin D endocrine system that is central to maintaining calcium and phosphate homeostasis see discussion below on functions and physiological actions. FGF23 acts by reducing the expression of renal sodiumâ€”phosphate transporters and reducing serum calcitriol levels. It is also stimulated by the hypophosphatemic action of FGF23 on renal phosphate excretion, but to a lesser extent. Furthermore, calcitriol can act as a suppressor of CYP27B1, although the mechanism is not fully understood. Calcitriol has its strongest metabolic activity in inducing its own destruction by stimulating the hydroxylase enzyme now known as CYP24A1; Figure Jones et al. CYP24A1 is largely responsible for the metabolic degradation of calcitriol and its precursor, 25OHD, and its deletion in the mouse results in 50 percent lethality at weaning and an inability to efficiently clear the active form of vitamin D Masuda et al. CYP24A1 carries out a series of reactions resulting ultimately in production of calcitroic acid from calcitriol and 1-desoxycalcitroic acid from 24,25 OH 2D, the major metabolite of 25OHD. These products are excreted through the bile into the feces Jones et al. The active forms of vitamin D2 are also catabolized by CYP24A1 into a series of biliary metabolites, somewhat analogous to those of vitamin D3. As described above, all naturally occurring vitamin D compounds interact with DBP. Calcitriol and vitamin D have significantly lower affinity for this protein than does 25OHD. Whereas vitamin D has an average lifetime in the body of approximately 2 months, 25OHD has a lifetime of 15 days, and calcitriol has a lifetime measured in hours Jones et al. Aside from these key elements in vitamin D metabolism, more than 30 other metabolites have been found, including the 3-epi series of vitamin D compounds DeLuca and Schnoes, ; Siu-Caldera et al. Their importance seems minimal and need not be discussed here. There are reports that vitamin D2 and vitamin D3 are differentially susceptible to these non-specific inactivating modifications, such as those occurring in the liver in response to a variety of drugs.

VITAMIN D AFFECTS MOST TISSUES IN THE BODY pdf

6: Vitamin D - Wikipedia

In fact, many of the body's tissues contain vitamin D receptors, proteins that bind to vitamin D. In the intestines, the receptors capture vitamin D, enabling efficient calcium absorption. But similar receptors are also present in many other organs, from the prostate to the heart, blood vessels, muscles, and endocrine glands.

It usually develops over time, since extra vitamin D can build up in the body. Nearly all vitamin D overdoses result from taking high amounts of vitamin D supplements. It is almost impossible to get too much vitamin D from sunlight or food. This is a detailed article about vitamin D toxicity and how much of it is considered to be too much. Vitamin D toxicity implies that vitamin D levels in the body are so high that they cause harm. It is also termed hypervitaminosis D. Vitamin D is a fat-soluble vitamin. In contrast to water-soluble vitamins, the body has no easy way of getting rid of fat-soluble vitamins. For this reason, excessive amounts may build up inside the body. However, we know that the active form of vitamin D functions in a similar way as a steroid hormone. It travels inside cells, telling them to turn genes on or off. Very little "free" vitamin D is available 1 , 2. This may lead to elevated levels of "free" vitamin D in the body, which may travel inside cells and overwhelm the signalling processes affected by vitamin D. One of the main signalling processes has to do with increasing the absorption of calcium from the digestive system 3. As a result, the main symptom of vitamin D toxicity is hypercalcemia - elevated levels of calcium in the blood 4 , 5. High calcium levels can cause various symptoms, and the calcium can also bind to other tissues and damage them. This includes the kidneys. Vitamin D toxicity is also termed hypervitaminosis D. It implies that vitamin D levels in the body are so high that they cause harm, leading to hypercalcemia and other symptoms. Vitamin D is an essential vitamin, and almost every cell in your body has a receptor for it 6. It is produced in the skin when it is exposed to sun. The main dietary sources of vitamin D are fish liver oils and fatty fish. Vitamin D is very important for bone health, and has also been linked with immune function and protection against cancer 7 , 8. Guidelines for blood levels of vitamin D are as follows 9 , 10 , 11 , 12 , 13 , A daily vitamin D intake of â€” IU 25â€” micrograms should be enough to ensure optimal blood levels for most people. Since relatively little is known about how vitamin D toxicity works, it is hard to define an exact threshold for safe or toxic vitamin D intake 5. However, doses up to 10, IU have not been shown to cause toxicity in healthy individuals 10 , Vitamin D toxicity is generally caused by excessive doses of vitamin D supplements, not by diet or sun exposure 16 , Although vitamin D toxicity is a very rare condition, recent increases in supplement use may lead to an increase in reported cases. A daily intake ranging from 40,â€”, IU â€” micrograms , for one to several months, has been shown to cause toxicity in humans 14 , 18 , 19 , 20 , This is times the recommended upper limit, in repeated doses. Several cases have also been caused by errors in manufacturing, when the supplements had times higher amounts of vitamin D than stated on the package 18 , 19 , Vitamin D toxicity is usually reversible, but severe cases may eventually cause kidney failure and calcification of the arteries 23 , The main consequence of vitamin D toxicity is a buildup of calcium in the blood, called hypercalcemia Early symptoms of hypercalcemia include nausea, vomiting, diarrhea, constipation and weakness Excessive thirst, an altered level of consciousness, high blood pressure, calcification in the kidney tubes, kidney failure or hearing loss may also develop 4 , Hypercalcemia caused by regularly taking high amounts of vitamin D supplements may take a few months to resolve. This is because vitamin D accumulates in body fat, and is released into the blood slowly 4. Treating vitamin D intoxication includes avoiding sun exposure and eliminating all dietary and supplemental vitamin D. Your doctor may also correct your calcium levels with increased salt and fluids, often by an intravenous saline. The main consequence of vitamin D toxicity is hypercalcemia, with symptoms including nausea, vomiting, weakness and kidney failure. Treatment involves limiting all vitamin D intake and sun exposure. Vitamin D is very unlikely to cause severe symptoms of toxicity right away, and symptoms may take months or years to show up. This is one reason why vitamin D toxicity is so difficult to detect. There have been reports of people taking very large doses of vitamin D for months without symptoms, yet blood tests revealed severe hypercalcemia and symptoms of kidney failure The harmful effects of vitamin D are very complex. High doses of vitamin D can cause hypercalcemia without toxicity symptoms, but can also

cause toxicity symptoms without hypercalcemia To be safe, you should not exceed the 4, IU mcg upper limit without consulting with a doctor or dietitian. Vitamin D toxicity usually develops over time, and the harmful effects are very complex. Large doses may cause damage, despite a lack of noticeable symptoms. It has been hypothesized that two other fat-soluble vitamins, vitamin K and vitamin A, may play important roles in vitamin D toxicity. A higher vitamin A intake may help prevent this from happening by sparing the vitamin K stores. Another nutrient that may be important is magnesium. It is one of the nutrients needed for improved bone health 31 , Taking vitamin A, vitamin K and magnesium with vitamin D may therefore improve bone function and reduce the chances of other tissues becoming calcified 33 , 34 , Keep in mind that these are just hypotheses, but it may be wise to make sure you are getting enough of these nutrients if you are going to supplement with vitamin D. If you are supplementing with vitamin D, then it may be important to also ensure sufficient intake of vitamin A, vitamin K and magnesium. These may reduce the risk of adverse effects from a higher vitamin D intake. Take Home Message People respond very differently to high doses of vitamin D. Therefore, it is hard to evaluate which doses are safe and which are not. Vitamin D toxicity can have devastating health effects, which may not show up until months or even years after starting to take high doses. Generally, it is not recommended to exceed the upper limit of safe intake, which is IU micrograms per day. Larger doses have not been linked with any additional health benefits, and may therefore be completely unnecessary. An occasional high dose of vitamin D is sometimes used to treat a deficiency, but always consult with your doctor or dietitian before taking a large dose. As with many other things in nutrition, more does not always equal better.

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7: Vitamin D and your health: Breaking old rules, raising new hopes - Harvard Health

The body makes vitamin D when the skin is directly exposed to the sun. That is why it is often called the "sunshine" vitamin. Most people meet at least some of their vitamin D needs this way.

But vitamin D is also produced by the body in a complex process that starts when rays in the invisible ultraviolet B UVB part of the light spectrum are absorbed by the skin. The liver, and then the kidneys, are involved in the steps that eventually result in a bioavailable form of the vitamin that the body can use. The latitude where you live. Short days and clothing that covers legs and arms also limit UVB exposure. The air pollution where you live. Carbon particulates in the air from the burning of fossil fuels, wood, and other materials scatter and absorb UVB rays. Ozone absorbs UVB radiation, so holes in the ozone layer could be a pollution problem that winds up enhancing vitamin D levels. Your use of sunscreen â€" in theory. Sunscreen prevents sunburn by blocking UVB light, so theoretically, sunscreen use lowers vitamin D levels. The color of your skin. Melanin is the substance in skin that makes it dark. As a result, dark-skinned people tend to require more UVB exposure than light-skinned people to generate the same amount of vitamin D. The temperature of your skin. Warm skin is a more efficient producer of vitamin D than cool skin. But studies have also shown that being obese is correlated with low vitamin D levels and that being overweight may affect the bioavailability of vitamin D. Yet the National Center for Health Statistics data on vitamin D levels fly in the face of the conventional wisdom that vitamin D inadequacy is a big problem among older people. The health of your gut. The vitamin D that is consumed in food or as a supplement is absorbed in the part of the small intestine immediately downstream from the stomach. Stomach juices, pancreatic secretions, bile from the liver, the integrity of the wall of the intestine â€" they all have some influence on how much of the vitamin is absorbed. The health of your liver and kidneys. Levels of the bioactive form of vitamin D tend to track with the health of the kidneys, so in someone with kidney disease, bioactive vitamin D levels decrease as the disease gets worse, and in end-stage kidney disease, the level is undetectable. A guide to the new nutrition Eat real food. Our knowledge of nutrition has come full circle, back to eating food that is as close as possible to the way nature made it. A guide to the new nutrition describes how to eat for optimum health. My teenage daughter wants us to switch from sugar to honey for health reasons. Is honey really any healthier than sugar? People began to use honey as a sweetener long before cane and beet sugar came into use. Minor ingredients include various complex sugars, minerals, vitamins, and proteins. Some of these ingredients have antioxidant properties, but the amounts are so small that they may not affect health. A tablespoon of honey contains about 64 calories; in comparison, a level tablespoon of table sugar contains 45 calories. Bakers like honey because it absorbs and retains moisture, helping to keep cakes and breads moist. Dentists, though, would probably advise you to brush after either honey or sugar to cut down on dental plaque and tooth decay. Most physicians would stay neutral â€" but pediatricians caution against feeding honey to children under one year because it may contain spores that can cause infant botulism.

VITAMIN D AFFECTS MOST TISSUES IN THE BODY pdf

8: Vitamin D: MedlinePlus Medical Encyclopedia

Too much vitamin D increases the amount of calcium in your blood, which can lead to calcium deposits in tissues throughout your body. It also removes calcium from your bones, causing bone damage. Don't exceed a daily vitamin D intake of 4, international units, recommends the Institute of Medicine.

Fat-soluble vitamins will not be lost when the foods that contain them are cooked. The body does not need these vitamins every day and stores them in the liver and adipose fat tissue when not used. Most people do not need vitamin supplements. Megadoses of vitamins A, D, E or K can be toxic and lead to health problems. Requirements for vitamins may be expressed in different mathematical units. Close attention should be paid to ensure that similar units are being compared. Vitamins are essential micronutrients your body needs in small amounts for various roles throughout the human body. Vitamins are divided into two groups: Unlike water-soluble vitamins that need regular replacement in the body, fat-soluble vitamins are stored in the liver and fatty tissues, and are eliminated much more slowly than watersoluble vitamins. For more information on water-soluble vitamins, see fact sheet 9. Vitamin B-Complex and Vitamin C. What are Fat-Soluble Vitamins? The fat-soluble vitamins, A, D, E, and K, are stored in the body for long periods of time and generally pose a greater risk for toxicity when consumed in excess than water-soluble vitamins. Eating a normal, well-balanced diet will not lead to toxicity in otherwise healthy individuals. However, taking vitamin supplements that contain megadoses of vitamins A, D, E and K may lead to toxicity. The body only needs small amounts of any vitamin. While diseases caused by a lack of fat-soluble vitamins are rare in the United States, symptoms of mild deficiency can develop without adequate amounts of vitamins in the diet. Additionally, some health problems may decrease the absorption of fat, and in turn, decrease the absorption of vitamins A, D, E and K. Consult a medical professional about any potential health problems that may interfere with vitamin absorption. In addition to helping the eyes adjust to light changes, vitamin A plays an important role in bone growth, tooth development, reproduction, cell division, gene expression, and regulation of the immune system. The skin, eyes, and mucous membranes of the mouth, nose, throat and lungs depend on vitamin A to remain moist. Vitamin A is also an important antioxidant that may play a role in the prevention of certain cancers. Food Sources for Vitamin A Eating a wide variety of foods is the best way to ensure that the body gets enough vitamin A. The retinol, retinal, and retinoic acid forms of vitamin A are supplied primarily by foods of animal origin such as dairy products, fish and liver. Some foods of plant origin contain the antioxidant, betacarotene, which the body converts to vitamin A. Beta-carotene, comes from fruits and vegetables, especially those that are orange or dark green in color. Vitamin A sources also include carrots, pumpkin, winter squash, dark green leafy vegetables and apricots, all of which are rich in beta-carotene. Retinol activity equivalents account for the fact that the body converts only a portion of betacarotene to retinol. One RAE equals 1 mcg of retinol or 12 mcg of beta-carotene Table 1. Recent studies indicate that vitamin A requirements may be increased due to hyperthyroidism, fever, infection, cold, and exposure to excessive amounts of sunlight. Those that consume excess alcohol or have renal disease should also increase intake of vitamin A. Vitamin A Deficiency Vitamin A deficiency in the United States is rare, but the disease that results is known as xerophthalmia. It most commonly occurs in developing nations usually due to malnutrition. Since vitamin A is stored in the liver, it may take up to 2 years for signs of deficiency to appear. Night blindness and very dry, rough skin may indicate a lack of vitamin A. Other signs of possible vitamin A deficiency include decreased resistance to infections, faulty tooth development, and slower bone growth. It would be difficult to reach this level consuming food alone, but some multivitamin supplements contain high doses of vitamin A. If you take a multivitamin, check the label to be sure the majority of vitamin A provided is in the form of beta-carotene, which appears to be safe. Symptoms of vitamin A toxicity include dry, itchy skin, headache, nausea, and loss of appetite. Signs of severe overuse over a short period of time include dizziness, blurred vision and slowed growth. Vitamin A toxicity also can cause severe birth defects and may increase the risk for hip fractures. It works by increasing the amount of calcium absorbed from the small intestine, helping to form and maintain bones. Vitamin D benefits the body by playing a role in immunity and controlling cell growth. Children

especially need adequate amounts of vitamin D to develop strong bones and healthy teeth. Food Sources for Vitamin D The primary food sources of vitamin D are milk and other dairy products fortified with vitamin D. Vitamin D is also found in oily fish e. In addition to the vitamin D provided by food, we obtain vitamin D through our skin which produces vitamin D in response to sunlight. From 12 months to age fifty, the RDA is set at 15 mcg. Twenty mcg of cholecalciferol equals International Units IU , which is the recommendation for maintenance of healthy bone for adults over fifty. Table 1 lists additional recommendations for various life stages. Exposure to ultraviolet light is necessary for the body to produce the active form of vitamin D. Ten to fifteen minutes of sunlight without sunscreen on the hands, arms and face, twice a week is sufficient to receive enough vitamin D. This can easily be obtained in the time spent riding a bike to work or taking a short walk. In order to reduce the risk for skin cancer one should apply sunscreen with an SPF of 15 or more, if time in the sun exceeds 10 to 15 minutes. Vitamin D Deficiency Symptoms of vitamin D deficiency in growing children include rickets long, soft bowed legs and flattening of the back of the skull. Vitamin D deficiency in adults may result in osteomalacia muscle and bone weakness , and osteoporosis loss of bone mass. Recently published data introduces a concern that some adults and children may be more prone to developing vitamin D deficiency due to an increase in sunscreen use. In addition, those that live in inner cities, wear clothing that covers most of the skin, or live in northern climates where little sun is seen in the winter are also prone to vitamin D deficiency. Since most foods have very low vitamin D levels unless they are enriched a deficiency may be more likely to develop without adequate exposure to sunlight. Adding fortified foods to the diet such as milk, and for adults including a supplement, are effective at ensuring adequate vitamin D intake and preventing low vitamin D levels. Vitamin D deficiency has been associated with increased risk of common cancers, autoimmune diseases, hypertension, and infectious disease. Who is at Risk â€" These populations may require extra vitamin D in the form of supplements or fortified foods: Human milk only provides 25 IU of vitamin D per liter. Those with dark pigmented skin synthesize less vitamin D upon exposure to sunlight compared to those with light pigmented skin. This population has a reduced ability to synthesize vitamin D upon exposure to sunlight, and is also more likely to stay indoors and wear sunscreen which blocks vitamin D synthesis. Covered and protected skin: Those that cover all of their skin with clothing while outside, and those that wear sunscreen with an SPF factor of 8, block most of the synthesis of vitamin D from sunlight. High doses of vitamin D supplements coupled with large amounts of fortified foods may cause accumulations in the liver and produce signs of poisoning. Signs of vitamin D toxicity include excess calcium in the blood, slowed mental and physical growth, decreased appetite, nausea and vomiting. It is especially important that infants and young children do not consume excess amounts of vitamin D regularly, due to their small body size. Tocopherol What is Vitamin E Vitamin E benefits the body by acting as an antioxidant, and protecting vitamins A and C, red blood cells, and essential fatty acids from destruction. Research from decades ago suggested that taking antioxidant supplements, vitamin E in particular, might help prevent heart disease and cancer. However, newer findings indicate that people who take antioxidant and vitamin E supplements are not better protected against heart disease and cancer than non-supplement users. Many studies show a link between regularly eating an antioxidant rich diet full of fruits and vegetables, and a lower risk for heart disease, cancer, and several other diseases. Essentially, recent research indicates that to receive the full benefits of antioxidants and phytonutrients in the diet, one should consume these compounds in the form of fruits and vegetables, not as supplements. Food Sources for Vitamin E About 60 percent of vitamin E in the diet comes from vegetable oil soybean, corn, cottonseed, and safflower. This also includes products made with vegetable oil margarine and salad dressing. Vitamin E sources also include fruits and vegetables, grains, nuts almonds and hazelnuts , seeds sunflower and fortified cereals. Food and supplement labels list alpha-tocopherol as the unit International units IU not in milligrams mg. One milligram of alpha-tocopherol equals to 1. RDA guidelines state that males and females over the age of 14 should receive 15 mcg of alpha-tocopherol per day. Consuming vitamin E in excess of the RDA does not result in any added benefits. Vitamin E Deficiency Vitamin E deficiency is rare. Cases of vitamin E deficiency usually only occur in premature infants and in those unable to absorb fats. Since vegetable oils are good sources of vitamin E, people who excessively reduce their total dietary fat may not get enough vitamin E. Vitamin E obtained from

food usually does not pose a risk for toxicity. Supplemental vitamin E is not recommended due to lack of evidence supporting any added health benefits. Megadoses of supplemental vitamin E may pose a hazard to people taking blood-thinning medications such as Coumadin also known as warfarin and those on statin drugs. Vitamin K What is Vitamin K Vitamin K is naturally produced by the bacteria in the intestines, and plays an essential role in normal blood clotting, promoting bone health, and helping to produce proteins for blood, bones, and kidneys. Food Sources for Vitamin K Good food sources of vitamin K are green, leafy-vegetables such as turnip greens, spinach, cauliflower, cabbage and broccoli, and certain vegetables oils including soybean oil, cottonseed oil, canola oil and olive oil. Animal foods, in general, contain limited amounts of vitamin K. Vitamin K Deficiency Without sufficient amounts of vitamin K, hemorrhaging can occur. Vitamin K deficiency may appear in infants or in people who take anticoagulants, such as Coumadin warfarin , or antibiotic drugs. Newborn babies lack the intestinal bacteria to produce vitamin K and need a supplement for the first week. Those on anticoagulant drugs blood thinners may become vitamin K deficient, but should not change their vitamin K intake without consulting a physician. People taking antibiotics may lack vitamin K temporarily because intestinal bacteria are sometimes killed as a result of long-term use of antibiotics. Also, people with chronic diarrhea may have problems absorbing sufficient amounts of vitamin K through the intestine and should consult their physician to determine if supplementation is necessary. People taking blood-thinning drugs or anticoagulants should moderate their intake of foods with vitamin K, because excess vitamin K can alter blood clotting times. Large doses of vitamin K are not advised.

9: Vitamin A Benefits Eye, Skin & Bone Health - Dr. Axe

The vitamin D that you get in your skin from sunlight, and the vitamin D from supplements, has to be changed by your body a number of times before it can be used. Once it's ready, your body uses it to manage the amount of calcium in your blood, bones and gut and to help cells all over your body to communicate properly.

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