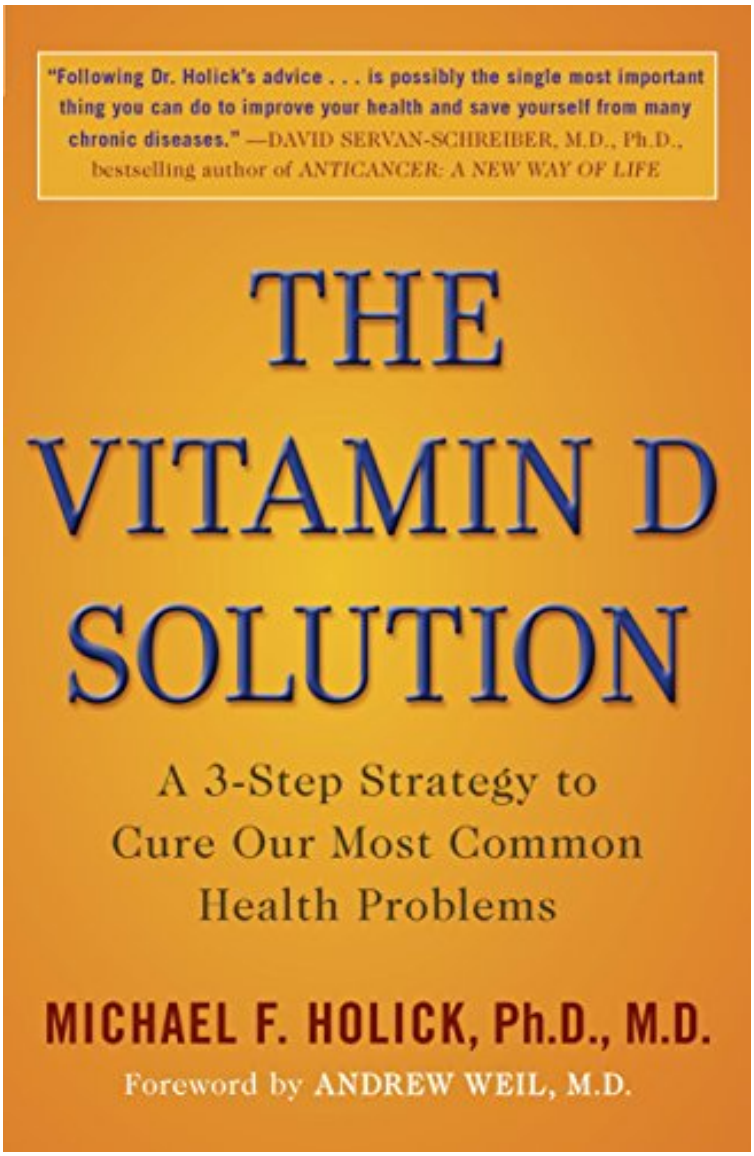
The Vitamin D Solution: A 3-Step Strategy to Cure Our Most Common Health Problems



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[Free read ebook] The Vitamin D Solution: A 3-Step Strategy to Cure Our Most Common Health Problems

Par Michael F. Holick Ph.D. M.D. : The Vitamin D Solution: A 3-Step Strategy to Cure Our Most Common Health Problems before purchasing it in order to gage whether or not it would be worth my time, and all praised The Vitamin D Solution: A 3-Step Strategy to Cure Our Most Common Health Problems:

Description :

Prsentation de l'diteur The world's leading expert on vitamin D reveals the missing link to achieving optimal health Vitamin D deficiency is the most common medical condition in the world. In America alone, over 200 million people lack sufficient levels of vitamin D and may consequently suffer from chronic health conditions, ranging from daily annoyances like fatigue and pain to life-threatening illnesses such as diabetes, heart disease, and cancer. But few people know why vitamin D is so important and what they can do to avoid the myriad ailments associated with deficiency, including heart disease, cancer, and osteoporosis.

There is no better person to demystify this vitamin and showcase its place in human health than author Michael F. Holick, M.D., Ph.D.-the father of modern vitamin D research. With more than three decades spent studying the relationship between vitamin D, limited sun exposure, and human well-being, Dr. Holick shares his findings on how combining the natural curative properties of the sun along with small lifestyle changes can help everyone to live a substantially healthier life. Armed with a three-step plan incorporating safe amounts of sun exposure, the right supplementation, and eating foods rich in vitamin D, Dr. Holick provides prescriptive advice for anyone- from relatively healthy people to those suffering from chronic or even fatal diseases- on how to easily rebuild and maintain optimal levels of this essential hormone. Rich with anecdotes and entertaining case studies, The Vitamin D Solution also presents research from around the world to serve as a wake-up call on this potentially lifesaving hormone for health.ExtraitCHAPTER 1 What Is Vitamin D? Is it a hormone or a vitamin? Somewhere along the equator a ten-year-old girl is growing up with- out the luxuries most of us enjoy on a daily basis. She will never learn how to use a computer, order a pizza to be delivered, or drive a car to the mall for clothes and cosmetics. She spends most of her days playing outside near her farming parents, and soon she will join them in tilling the soil. She will never learn to read or write. She will endure periods of poor nutrition and poverty. And she knows nothing about sunblock and probably never will. Now lets sail north to the United States or Europe, where another ten-year-old girl leads an immensely different life. She is maturing into a savvy user of electronics, passes the majority of her days indoors at a rigorous school, has access to the best nutrition and all the benets that modern medicine can provide, and will know what SPF means long before graduating from high school and pursing higher education. If both girls continue on their separate paths, the equatorial girl will be at least half as likely to get cancer during her lifetime as her northern counterpart. She also will have an 80 percent reduced risk of developing type 1 diabetes in the rst thirty years of her life. In fact, barring any freak accident or untreated medical condition, her longevity overall will be 7 percent greater. The northern girl, on the other hand, faces a host of increased health risks throughout her life, from breast and ovarian cancer to depression, obesity, type 2 diabetes, osteoporosis, arthritis, high blood pressure, heart disease, and stroke. She will be more susceptible to upper-respiratory-tract infections, dental cavities and gum disease, and infectious diseases like the u and tuberculosis. As a group, she and her girlfriends will break their arms 56 percent more often than their peers did just forty years ago. Because she was born in northern latitudes and has lived there for the rst ten years of her life, for the rest of her life she has a 100 percent increased risk of developing multiple sclerosis no matter where she chooses to live in the world after age ten. She would likely lose in a jumping contest with her equatorial sister, who can jump higher and with more force. If she complains of muscle weakness and wide- spread muscle and joint pain later on in adulthood, her doctor will likely diagnose bromyalgia or chronic fatigue syndrome when tests dont turn up anything specic. The equatorial girl might never experience such debilitating aches or chronic pain and in fact may develop into a much stronger, leaner, and more fertile woman. If both women become pregnant, the equatorial mom-to-be wont have to worry as much about serious complications like preeclampsia. And she wont have trouble giving birth the old-fashioned way. The northern mom-to-be, however, will have a much higher risk of having an unplanned C-section and of giving birth to a child who will suffer from schizophrenia. By the time the northern girl reaches midlife and her later years, chances are good that shell have been treated for an internal cancer (breast, colon, ovarian, pancreatictake your pick) at some point and been prescribed multiple drugs to combat chronic ailments like hypertension, osteoporosis, arthritis, depression, obesity, type 2 diabetes, dementia, Alzheimers, and perhaps even insomnia. Because of a signicant loss of bone mass, she will be terried of falling and fracturing a bone, and therefore will have limited some of her favorite outdoor activities, such as tennis, skiing, horseback riding, and golf, signicantly cutting back on physical activity. And because she will have lost a considerable amount of muscle strength, her biological age will be much older than she really is. The equatorial woman not only may outlive her northern counterpart, but shell also be less prone to chronic diseases that afict her northern counterpart. For this reason, the equatorial woman may, overall, enjoy a higher quality of lifeeven when advanced age sets in. Whats going on here? The answer lies in the difference between these two girls exposure to natural sunlight, which is our main source of vita- min D. Obviously, Ive taken some liberty in letting a few assumptions go. The equatorial girls limited access to health care and preventative medicine has its own basket of risks, but lets focus for a moment just on the difference in exposure to sunlight and the conclusions that can be drawn from that single fact. Lets also assume that these girls grow up to exhibit vastly different levels of vitamin D in their systems, which is not a stretch given the documented records of vitamin D deciency patterns across the globe. If I

were to test each of these girls vitamin D levels, I would not be surprised to nd the northern girls levels terribly low as compared to her equatorial counterpart. And that difference means everything. The sun is as vital to your health and well-being as food, shelter, water, and oxygen. Im going to prove it to you through a comprehensive exploration of vitamin D. What does vitamin D have to do with aging and disease? More than we ever imagined. Our Most Common Health Challenge When I tell people that vitamin D deciency is our most common health challenge globally, the response I get is pretty much the same in wealthy, developed nations: Well, that cant happen to me or anyone else in my country; besides, we have great health care. And when I remind people that the best way to ensure healthy levels of vitamin D is through sensible sun exposure two to three times a week, a common thread is heard in the response, which is along the lines of, You cant be serious. The sun is the demon of cancer and aging. No way am I going to consider sunlight as medicine. Its just not possible. The statistics proving otherwise speak volumes, and youre going to hear about them throughout this book. Increasing numbers of studies are conrming the link between vitamin D and optimal health, and attitudes are beginning to shift. Researchers have long known that the sunshine vitamin boosts bone strength by encouraging the body to absorb calcium, but only recently have we begun to see just how far- reaching vitamin D is in maintaining the health of every system and cell in the bodys intricate machinery. Vitamin D may be as vital to your heart and brain health, for example, as it is to your bone health. As noted in the introduction, increasing the amount of vitamin D in the body can prevent or help treat a remarkable number of ailments, from high blood pressure to back pain, from diabetes to arthritis, from upper-respiratory- tract infections to infectious diseases, and from bromyalgia to cancer. It also seems to improve fertility, weight control, and memory. The evidence is clear: just as we require a little fat and salt for survival, we need the sun in moderation, too. Ill add to that the following fact, which will be fully explored in chapter 8: there is essentially no substantiated scientic evidence to suggest that moderate sun exposure signicantly increases risks of benign skin cancers or, and more importantly, the most deadly form of skin cancer, melanoma. In fact, if you were unfortunately to develop melanoma, you would be more likely to survive it if you had adequate sun exposure as a child and young adult. And if you had adequate sun exposure as a child, you would have a 40 percent reduced risk of developing lymphoma as a young adult. In the past ve years alone there has been a breakthrough in our understanding of why sun exposure benets health in so many ways, something that was not fully comprehended until now. This breakthrough has forced people to take a closer look at the value of sun exposure. I am proud to say that I have been at the forefront of this research. Groundbreaking new research has linked a wide array of disorders that afict up to two hundred million Americans to a single common factorvitamin D deciency or insufciency, the most common medical condition in the world with sometimes devastating, if not fatal, consequences. And the research keeps coming from various labs around the world investigating vitamin D. As I write this, doctors at the University of Pennsylvania have revealed that vitamin D can prevent or forestall the irreversible decline in respiratory function over time that leaves many asthmatics even more vulnerable when they suffer an asthma attack. At the same time, scientists at the Moores Cancer Center at the University of California at San Diego have raised the possibility that low vitamin D may be the root cause of cancer. No doubt we will continue to see remarkable studies emerge, and youll be reading about some of the more fascinating and profound studies in the upcoming chapters. Its no wonder that this vitamin made Time magazines list of the top ten medical breakthroughs of 2007. So if you can dramatically decrease your risk of illness and age-related disease and live a healthier, happier life without its costing you a pennywouldnt you want to do that? Centuries of Problem Solving When you put the vitamin D story into the perspective of human history, it begins with the Industrial Revolution. As the revolution began to sweep across northern Europe in the mid-seventeenth century, doctors reported seeing a new disease that aficted young children with a constellation of physical signs and symptoms, notably deformities of the skeleton, such as bowed legs, misshapen pelvis, enlarged head, prominent knobby projections along the ribs, curvature of the spine, poor teeth, and weak and abby legs. The disease had devastating consequences. It not only retarded growth and carried serious risk of upper- respiratory-tract infections including tuberculosis and inuenza, but it also had far-reaching effects into adulthood and impaired these childrens ability to function throughout their lives. Women with a distorted pelvis often had difculty with childbirth and were at high risk of dying or giving birth to an unhealthy child. Several theories about the cause of this debilitating disease called rickets surfaced in the early 1900s, including infection, lack of activity, poor nutrition, and an inherited disorder. Although cod liver oil (high in vitamin D) appeared to be effective in preventing the disease, it was principally used on the coastlines of the Scandinavian countries and the United Kingdom and was not widely used elsewhere. The disease continued

to plague the industrial centers of the world. What was happening was that as people began to congregate in Great Britain and northern Europe, they erected cities whose tightly placed buildings closed off to sunlight the alleys where kids were hanging out and living. Compounding the problem was the gathering pollution from coal burning, which thickened the air and blocked the suns rays. When these kids started to show signs of bone deformities, doctors began to take note. Water works wonders, air can do even more, but light works best of all. In the 1820s, a Polish doctor named Jedrzej Sniadecki observed that children who lived in the city of Warsaw had a much higher prevalence of rickets than youngsters who lived in the Polish countryside. Dr. Sniadecki thought it was probably the lack of sunshine in the cramped connes of Warsaw that was to blame for this widespread condition. He was able to successfully treat the aficted city kids by taking them into the country- side for sun exposure. But he wasnt taken seriously. It was inconceivable to the scientic community at the time that exposure of skin to sunlight could have any impact on the skeleton. Indeed, it would take another seventy years before the British Medical Association in 1889 reported that rickets was rarely seen in the rural districts of the British Isles but was prevalent in large industrialized towns, suggesting that lack of sun exposure was responsible for the high incidence of rickets. A year later, a British doctor collected clinical observations from a number of his colleagues throughout the British Empire and the Orient and found that rickets abounded in the industrialized centers of Great Britain, whereas the impoverished cities of China, Japan, and India, where people lived in squalor and had poor nutrition, were spared from this bone-deforming disease. But like Dr. Sniadecki, this early visionarys ndings werent taken seriously. Although the exact relationship between sunlight and bone development was not yet understood, a health movement was pioneered by Arnold Rikli at the end of the 1800s with this motto: Water works wonders, air can do even more, but [sun] light works best of all. It was difcult for the scientic community to embrace the concept that the simple remedy of exposure to sunlight could cure this bone-de- forming disease, and little was done to use these insightful observations for the prevention and cure of rickets. When scientists began investigating the connection between sunlight and health, it was initially believed that the warmth generated by the sun conferred the health benets. It was Sir Eve- rard Home, who, in the late 1700s and early 1800s, deduced that it wasnt the heat of the suns radiation but rather the occurrence of a chemical effect on the body caused by the sun that produced sunburn. Home also showed that dark-skinned people had a natural resistance to sunburn. By 1900, it was estimated that 80 percent of the children living in the industrialized cities of northern Europe and the northeastern United States were aficted with rickets. Almost one hundred years after Dr. Sniadeckis rst report, a German physician by the name of Kurt Huldschinsky reported that exposure to ultraviolet radiation from a mercury arc lamp was an effective method of curing patients with severe rickets. He cleverly demonstrated that the effect of phototherapy was not a direct effect on the skeleton, inasmuch as exposure of one arm had an equal and dramatic effect on the cure of rickets in both arms. People thought he was nuts for irradiating sick kids with a mercury arc lamp (mind you, this was long before skin cancer became part of the conversation), but some took his idea to heart. Two years later, in 1921, two New York doctors (Hess and Unger) exposed eight children suffering from rickets to sunlight on the rooftop of a New York City hospital. They showed through X-ray examination marked improvement in each child. Finally, the scientic community was ready to listen. In the early 1930s, the U.S. government set up an agency that recom- mended to parents that they put their children outside for a reasonable amount of sun exposure. Several manufacturers also began to produce ultraviolet (UV) lamps that were then sold in local pharmacies through- out the 1930s, 40s, and 50s. I know, difcult to believe given todays attitude on ultraviolet radiation. Heliotherapy Takes Hold By the beginning of the twentieth century, scientists had determined that it was the UV radiation in sunlight that stimulated the production of vitamin D in the human body. They deduced that this was important for a variety of health reasons. Based on ndings that the vitamin D created by sun exposure improved bone health, the dairy industries of Europe and the United States started fortifying milk with vitamin D. A craze was under way, and vitamin D fortication was being touted by food and beverage manufacturers ad nauseam. Products as varied as Bond bread, Richters hot dogs, Twang soda, and even Schlitz beer were sold with the promise of delivering vitamin D. The rst few decades of the twentieth century were the heyday of photobiology and heliotherapy. Photobiology is the branch of science that investigates the effect of natural and articial radiation on all life forms; heliotherapy focuses on the suns abilities to heal the sick. Photobiologists and heliotherapists were credited with developing effective treatments for rickets, tuberculosis, and the skin disorder psoriasis. Hospitals all over Europe and the United States built solaria and balconies so they could offer their patients a pleasant place to enjoy the suns healing rays. In Boston, the then Childrens Hospital put rachitic children on a boat and had them exposed to direct

sunlight, which they could not get in the crowded, polluted downtown air. This gave rise to the Boston Floating Hospital, which still exists today (as the Floating Hospital for Children) at Tufts Medical Center. In 1903, photobiologist Dr. Niels Ryberg Finsen won the Nobel Prize for medicine after successfully demonstrating that exposure to sunlight cured many diseases, including lupus vulgaris, or tuberculosis of the skin. Rickets on the Rise Its hard to imagine a government recommending the deliberate exposure of children to sunlight. But our government did just that in 1931 when it set up an agency to encourage parents to expose their children to sunlight to prevent rickets. But theres been a 180-degree turn in just the last forty years. Today, parents are likely to be accused of child endangerment or abuse if they let their kids roam sunscreen- free in playgrounds and at the beach. This all comes with a serious consequence. Rickets is not a thing of the past. Its been on the rise lately, and in cities like Boston we see half a dozen cases a year. The main reason this is happening is that human breast milk today hardly contains any vita- min D, and without adequate sun exposure or a vitamin D supplement, infants are at a high risk of developing rickets. In fact, in one of my studies we looked at forty newborn babies whose mothers were seemingly doing everything right before giving birth. Seventy percent of them took prenatal vitamins, 90 percent drank fortied milk, and all ate shone of the best dietary sources for vitamin Dregularly during their pregnancy. Upon giving birth, 76 percent of the moms and a full 81 percent of the newborns were vitamin D decient. In all, 90 percent to 95 percent of most peoples vitamin D requirement comes from casual exposure to sunlight. Another reason rickets is cropping up again with increasing frequency is that many kids these days spend too much time indoors and out of the sun or are slathered in sunscreen and made to wear protective clothing before they go out to play. Even more alarming is a new epidemic in which bone formation in children appears normal but is actually much softer than it should be. Girls today break their arms 56 percent more often than their peers did forty years ago. Boys break their arms 32 percent more often. Just last year, the American Academy of Pediatrics felt compelled to double its recommended daily vitamin D intake for newborns, children, and adolescents, citing concern over rising levels of rickets as well as the explosion of new evidence demonstrating that higher vitamin D intake may help prevent a wide variety of diseases. Eventually, even the American Academy of Dermatology, which had been having the hardest time accepting recent statistics on rickets and accompanying literature on vitamin D, chimed in. In July of 2009, the American Academy of Dermatology issued a revised position statement on vitamin D after an updated review of the increasing body of scientic literature on this vitamin and its importance for optimal health. While still extremely gun-shy about endorsing sensible sun exposure (in fact, the statement plainly reminded members about the dangers of UV radiation in the development of skin cancer, saying, Vitamin D should not be obtained from unprotected exposure to ultraviolet radiation), the academy urged its members to remain vigilant about the importance of vitamin D and to pay attention to patients who are at high risk of deciency. It said that those who are at risk for a deciency should be encouraged to up their vitamin D intake through diet and supplementsnot through sun exposure. I am happy to see this baby-step forward, even though the academy still cannot fathom sensible sun exposure as an option that could be more effective and benecial overall. I was amused to learn that when dermatologists in Australia had their own vitamin D levels checked, 87 percent of them were decient! Indeed, the proof is in their own pudding. The doctrine of dermatology will take time to rewrite, but in the meantime, each one of us can establish and follow our own canon of health. Poor bone health and childhood rickets is just the tip of the vitamin D iceberg. Increasing numbers of adults are developing a vitamin D deciencyrelated bone condition known as osteomalacia (pronounced os-tee-oh-muh-LAY-shuh), sometimes called adult rickets. Unlike the brittle-bone disease osteoporosis, which doesnt cause bone pain and is more common in older adults, osteomalacia is characterized by vague but often intense bone and muscles aches and is frequently misdiagnosed as fibromyalgia, chronic fatigue syndrome, or arthritis. The bromyalgia epidemic that some doctors refer to may actually be a massive increase in vitamin D deciencyrelated osteomalacia (see chapter 3 for more on this important subject). Ive estimated that 40 percent to 60 percent of patients who have been diagnosed with fibromyalgia or chronic fatigue have a vitamin D deciency and suffer from osteomalacia. One such patient who eventually found me was pain free after just six months of treatment to raise her blood levels of vitamin D. Her bromyalgia simply vanished and her bone density improved by more than 25 percent after the rst year. As I chronicled in the comparison of the two ctional ten-year-old girls at the start of this chapter, a vitamin D deciency sets one up for myriad health risks across the board and throughout ones life. If you are vitamin D decient in childhood, you are more than twice as likely to develop type 1 diabetes. If you live above 35 degrees north latitude (roughly the latitude of Atlanta and Los Angeles), you are twice as likely to develop multiple sclerosis. Living at higher

latitudes also means a higher risk of Crohns disease, infections, and high blood pressure. Theres evidence to suggest that if you raise your level of vitamin D to a certain amount (and Ill explain exactly what those levels are in chapter 2), you can reduce your risk of colorectal, ovarian, pancreatic, prostate, and breast cancer by as much as 30 percent to 50 percent. You can also reduce your risk of hypertension, stroke, and heart attack by as much as 50 percent. If youre a woman contemplating pregnancy, healthy vitamin D levels can improve fertility, prevent an unplanned C-section, and ensure a healthier baby who will enjoy a healthier life. Women may lower their risk of rheumatoid arthritis by 42 percent, and decrease their risk of multiple sclerosis by more than 40 percent. And with adequate levels of vitamin D you will live longer. A Hormone, Not a Vitamin Naturally, were disposed to think about vitamin D as a vitamina sub- stance that we get from our diets, like vitamin C or niacin, and that participates in biological reactions to help the body operate optimally. But despite its name, vitamin D isnt really a vitamin, and as Ive said, you cant rely on diet to obtain it; you do, however, make it in your skin. Vitamin D is in a class by itself; its far-reaching effects on the body are aligned with how hormones act to inuence metabolic pathways, cellular functions, and the expression of myriad genes. Vitamin Ds active metabolic product in the body, in fact, is a molecule called 1,25- dihydroxyvitamin D (lets call it 1,25-vitamin D for simplicity), which is a secosteroid hormone that directly or indirectly targets more than two thousand genes, or about 6 percent of the human genome. (Ill be talking about vitamin Ds two different formsvitamin D2 and vitamin D 3. For the purposes of the book Ill be discussing vitamin D2 or vitamin D 3 as vitamin D, and Ill only refer to specic forms of vitamin D where appropriate.) Generally speaking, vitamins are organic compounds that cannot be made by the body but are necessary for proper functioning. (The term vitamin comes from vital aminea substance that is essential for health but cannot be made by the body.) Obtained through the diet or supplementation, vitamins are vital to growth, development, and metabolic reactions. Hormones, on the other hand, are synthesized in the body from simple precursors and go to distant tissues where they have an intended effect and make multiple metabolic improvements. In the case of the manufacture of vitamin D, which requires the help of an outside source to trigger a sequence of events, the precursor of a cholesterol-like molecule found in the skin cell (7-dehydrocholesterol; provitamin D3) starts the process by absorbing just the ultraviolet B portion of sunlight to create whats called previtamin D3. Previtamin D3 quickly rearranges itself with the help of the bodys heat to give birth to vitamin D, which immediately exits the skin cell for the bloodstream. The fact that vitamin D is made in living skin cells explains why it is not possible to wash off vitamin D when you bathe after being exposed to the sun. Before vitamin D can act as a hormone, however, it must go through two steps of activationone in your liver and another in your kidneys. Ill be taking you through the details of how vitamin D gets made in your body from sunlight to its active, circulating form in the next chapter. The process is yet another example of how our brilliant bodies operate and self-regulate to ensure optimal health. If you apply a sunscreen with an SPF of 8 into your skin, it will absorb about 90 percent of UVB radiation and decrease your ability to make vitamin D in your skin by about 90 percent. An SPF of 30 reduces your ability by 99 percent. While its true that most people dont put sunscreen on properly, people are now using sunscreen with an SPF of 45 or above, so even if you put on half or one third of the recommended amount, youre still getting an SPF of 15 and reducing your ability to make vitamin D in your skin by about 95 percent. Farmers in the Midwest who had a history of nonmelanoma skin cancer were told to always use sun protection, and they did. When we measured their blood levels of vitamin D at the end of the summer, most were decient. Most humans obtain from sun exposure their vitamin D requirement between the hours of about 10:00 A.M. and 3:00 P.M. and mainly in the late spring, summer, and early fall. Because vitamin D is fat soluble, its stored in body fat and released throughout the winter months, allowing you to be vitamin D sufcient throughout the year. Hormones are more sophisticated, complex molecules than vitamins. They can act in two ways: rst, they can simply enter the cell and travel through the sea of cellular cytoplasm until they reach the nucleusthe brain of the celland inuence its activity; second, they can bind to a receptor on a cell membrane and thereby transmit a signal to the cell, telling it to change what it is doing in any number of ways. Activated vitamin D mainly works by interacting with its receptor within the cells nucleus. From Bone Health to Brain Health Contrary to what was previously believedthat vitamin D receptors were only in bones, intestines, and kidneyswe now know that vitamin D receptors are everywhere in the body. There is even proof that vita- min D receptors exist in the brain and that the active form of vitamin D stimulates the production of mood-elevating serotonin. This explains how it may help reduce depression (or just a chronically foul mood). Fat cells, too, have vitamin D receptors, and fat cells can be more metabolically active (burn more calories) if they have more vitamin D. People tend to think that fat cells are like inanimate

blobs of lard when in fact they are active participants in the process by which your brain learns that youre full and dont need to take another bite of food. When youve had enough, fat cells secrete a hormone called leptin that allows you to push away from the table. A lack of vitamin D will interfere with this appetite-suppressing hormone whose job it is to regulate your body weight. And we all know what an unchecked appetite can lead to: weight gain and a higher risk of developing type 2 diabetes. Speaking of which, vitamin D deciency has also been shown to exacerbate type 2 diabetes, impair insulin production in the pancreas, and increase insulin resistance. The fact that every tissue and cell in your body has a vitamin D receptor raises a question: why would those receptors be there if they werent meant to have an effect? Many of us in the science community think that vitamin D acts as a sentinel for your health in that it can control cell growth. This means it can affect the instigation of cancer. If a cell begins to lose control of its own growth and is on a path to becoming a malignant cancer cell, activated vitamin D can come to the rescue by either turning on genes to control cell growth or inducing apoptosisa process whereby the cell kills itself. If the tumor takes hold and begins to grow, active vitamin D has one more trick up its sleeve: it prevents blood vessels from forming to supply nutrition that the cancer needs to survive. Once the malignant process begins, unfortunately, cancer cleverly develops systems to become resistant to the benecial effect of the active form of vitamin D. This is why it is so important to be vitamin D sufcient throughout your life. Just as a gap in your car insurance coverage leaves you vulnerable to costly accidents, a period of time when your body lacks sufcient vitamin D to act on those ubiquitous receptors leaves you vulnerable to disease. In fact, it is known that if you have lung cancer detected in the winter, you are likely to die more quickly than if you had been diagnosed in the summer. Could that be a coincidence, or does lung cancer have something to do with vitamin D? Sufce it to say that in some respected medical circles, sunlight is being described as a wonder drug. Dr. William Grant, director of the Sunlight, Nutrition and Health Research Center in San Francisco and a highly respected scientist in the eld, has suggested that increased sun exposure would result in 185,000 fewer cases of internal cancers (specically, cancers of the breast, ovaries, colon, prostate, bladder, uterus, esophagus, rectum, and stomach) every year and 30,000 fewer deaths in the United States alone. Other researchers have taken this a step further and looked at the global impact. University of California researchers estimate that 250,000 cases of colon cancer and 350,000 cases of breast cancer could be prevented worldwide by increasing intake of vitamin D. Sunlight has a similarly dramatic effect on high blood pressure, one of the leading causes of heart attack and stroke. People who spend time in the sun or on a tanning bed experience a blood pressurelowering effect similar to that of standard medications that have unpleasant side effects. In my studies, backed by those of others, Ive found that sun- light has a benecial effect on heart health on par with the benets of exercise. Put those two things togetherphysical tness and UVB exposureand youve got a magical alchemy of health benets. Benefits of Vitamin D in Brief Bone health: prevents osteopenia, osteoporosis, osteomalacia, rickets, and fractures Cellular health: prevents certain cancers, such as prostate, pancreatic, breast, ovarian, and colon; prevents infectious diseases and upper-respiratory-tract infections, asthma, and wheezing disorders Organ health: prevents heart disease and stroke; prevents type 2 diabetes, periodontitis and tooth loss, and other inammatory diseases Muscular health: supports muscle strength Autoimmune health: prevents multiple sclerosis, type 1 diabetes mellitus, Crohns disease, and rheumatoid arthritis Brain health: prevents depression, schizophrenia, Alzheimers disease, and dementia Mood-related health: prevents seasonal affective disorder, premenstrual syndrome (PMS, also known as premenstrual tension), and sleeping disorders, elevates the sense of well-being And then, of course, theres bone health. Sun exposure helps build and maintain bone density and reduces fractures, one of the main causes of death and disability among senior citizens. Humans also need sunlight to control their biological clocks, which regulate mood, and appropriate sun exposure is responsible for keeping down rates of depression associated with seasonal affective disorder (SAD) and premenstrual syndrome (PMS). Lets not forget that sunlight plain old makes you feel betternot something to be dismissed in the high-stress world in which many of us live. Those who heed warnings to avoid the sun because sunlight is dangerous are robbed of the life-sustaining benets of sun exposureand the idea that sunlight is dangerous denies basic evolutionary science. The Complexities of a Modern Epidemic To say that our fear of sunlight and our excessive use of sunscreen have put a serious damper on our ability to maintain sufcient levels of vita- min D is one thing. But there are other variables that make todays deciency epidemic a unique challenge. Age, gender, race, geographic location, cultural factors, diet, drugs, and even certain health conditions like obesity, liver disease, intestinal disease, and kidney disease all factor in. People who have undergone bariatric surgery to gain control of their weight have added challenges. For starters, skin color has

a tremendous impact, which is evident in studies done to identify patterns of deciency. My team did a study in Boston at the end of the summera time when you would expect blood levels of vitamin D to be the highestand found that 40 percent of Hispanics, 34 percent of whites, and a breathtaking 84 percent of African-American adults over the age of fty were vitamin D decient. The darker your skin, the harder it is to make vitamin D, because melanin, your skins pigment that gives it color, acts as a natural sunscreen; African Americans have to spend at least two times (and as much as ten times) longer in the sun to make the same amount of vitamin D as a person of Irish or Scandinavian descent (more on this later). The vitamin D deciency in this community may help explain why theres a health disparity between whites and blacks, with a disproportionate number of African Americans suffering from hypertension, heart disease, type 2 diabetes, deadly cancers, and stroke, as compared to Caucasians. Another study my colleagues and I published showed that 36 percent of healthy white men and women in Boston (medical students and doctors) ages eighteen to twenty-nine were vitamin D decient at the end of winter. This was despite the fact that they often took a multivitamin, drank at least one glass of fortied milk a day, and ate sh at least once a week. The problem is worse the older you get42 percent of other- wise healthy Boston-area adults over the age of fty who participated in the study were found to be vitamin D decient. The older you are, the harder it becomes to synthesize enough vitamin D. A seventy-year-old has only a quarter of the vitamin Dmaking capacity that a twenty-year- old has. The good news is that if you expose older people to sunlight a few days a week, theylike anyone elsecan maintain adequate levels. But a lot of our elderly are not getting the bare minimum time they require in the sun sans the sunscreen and oppy hatsto literally get their vitamin D blood running. Thats not to say, though, that youths are likely to have adequate levels of vitamin D. Another study in nine- to eleven-year-old girls in Bangor, Maine, revealed that 48 percent were vitamin D decient at the end of the winter. Seventeen percent remained vitamin D decient at the end of the summer. When the Centers for Disease Control and Prevention did a study in the United States at the end of the winter, it found that 48 percent of African American women, in their childbearing years (fteen to forty-nine years of age) were vitamin D decient. Dr. Catherine Gordon and her colleagues at Bostons Childrens Hospital reported that 52 percent of adolescent Hispanic and African American boys and girls tested were vitamin D decient throughout the year. The rst national assessment of this crucial nutrient in young Americans came out in August of 2009, broadcasting more mind-boggling statistics. About 9 percent of those ages one to twenty-one, or roughly 7.6 million children, adolescents, and young adults, are decient, while an additional 61 percent (50.8 million) have levels low enough to be considered insufcient. This was confirmed by another study reporting that 50 percent of children one to five years of age, and 70 percent of children six to eleven years of age, were either vitamin D insufficient or deficient. This was new evidence that low vitamin D levels could be putting our nations next generation at an increased risk for heart disease and diabetes, two of our biggest health problems worsened by the epidemic of childhood obesity. In fact, it was recently reported that teens who were vitamin D deficient or insufficient had a morethan200 percent increased risk of high blood pressure and high blood sugar and a 400 percent increased risk of having pretype 2 diabetes (also known as metabolic syndrome), compared to teens who were vitamin D sufficient. This theme is played out whether you live in Florida or Alaska. Its pervasive, in fact, in all parts of the world. Its natural to assume that Floridians, for instance, would have no problem keeping their vitamin D levels up. But one study demonstrated that their blood levels defy their geography; vitamin D deficiency among Floridians was still 42 percent. After performing a study on themselves, doctors in India reported that 90 percent of Indian physicianswhether they lived in Bombay or New Delhiwere deficient. They now have reported that 50 percent to 80 percent of adult Indians are vitamin D deficient. More than 50 percent of children in New Delhi are vitamin D deficient. Even in places like Cape Town, South Africa, and Riyadh, Saudi Arabia, vitamin D deficiency has been shown to be a problem. If you compare your skins vitamin D synthetic activity in the summer to what it is in the winter, youll see an 80 percent to 100 percent reduction in vitamin D synthesis in the wintereven in a place like Florida. If you live farther north than Atlanta, Georgia, you essentially cant make any vitamin D in your skin from about November through March. In the early morning or late afternoon, even at the equator with the sun shining, youre still not making vitamin D, because the zenith angle of the sun is so oblique that most of the UVB photons that make vitamin D are absorbed by the ozone layer. In later chapters Ill delve more into these as well as other factors that compound this epidemic, but in brief I want to mention one of the more misunderstood features of this problem: the link between vitamin D deficiency and obesity. Because vitamin D is stored in fat cells, youd think that people with excess fat would have plenty of extra vitamin D on hand to make up any shortage. As it turns out, that

thinking is wrong, and a parallel relationship exists between vitamin D deficiency and obesity. The fatter you are, the higher your risk for a deficiency. Why? The vitamin D essentially gets locked inside the fat cells, unavailable for use. In one of my studies, we exposed obese and nonobese individuals to the same amount of UVB radiation and showed that obese people can only raise their blood levels of vitamin D by about 45 percent com- pared to a normal-weight person. Obese people (defined as those with a body mass index, or BMI, above 30) often need at least twice as much vitamin D to satisfy their bodys needs. With the majority of Americans overweight or obese these days, its not a stretch to understand why a similar number of people are vitamin D deficient. The two epidemics have worsened in unison. Whats more, obesity and osteomalacia often go hand in hand, trip- ping a vicious cycle that worsens the obesity, the osteomalacia, and the vitamin D deficiency like a perfect storm. As I described, osteomalacia is characterized by extreme bone and muscle pain and weakness. Being overweight predisposes a person to osteomalacia because the excess fat absorbs and holds on to the vitamin D from the sun and diet so that it cannot be used for properly mineralizing the skeleton or for main- taining cellular health. In addition, obese people are frequently vitamin D deprived because they go outside much less, for practical and self- esteem-related reasons. This only perpetuates the problem. When an obese person has osteomalacia, the bone and muscle pain and weakness make it virtually impossible to participate in any sort of physical activity that might help the individual take control of his or her weight. As a result, the individual remains obese or perhaps gains more weight, which in turn worsens his or her vitamin D status and exacerbates the osteomalacia. Treating a persons vitamin D deficiency can cure osteomalacia and open the world of exercise up to an obese individual. A study I participated in showed that it was possible to increase obese peoples vitamin D levels by exposing them to UVB radiation, in this case from a tanning bed, or giving them more vitamin D in supplement form. These treatments may have benefits other than enabling the patients to exercise. Recall that I explained how being vitamin D deficient interferes with the secretion of an appetite-suppressing hormone called leptin, which signals the brain when a person has consumed enough fat. Building the vitamin D in a persons bloodstream to normal levels will restore that process. Those three elements alonelessening bone pain, making exercise easier by improving muscle strength, and rebalancing the appetite hormonecan combine to have a dramatic effect on an individuals effort to put an end to the obesity and adopt a healthier life. Much more research needs to be done, but I think there is enormous potential for UVB exposure from the sun or artificial sources to be used to treat people with obesity. But I Consume Lots of Fortified Milk, Cereal, and Juice, and I Take a Multi! When people express doubt over the possibility that they are vitamin D deficient because they dont fall under any of the usual high- risk categories, I remind them that its nearly impossible to meet the requirements through diet and a daily multivitamin. As Ill explain further in chapter 10, the current recommendations are inadequate. Look at your multivitamins packaging: I bet it contains 400 IU of vitamin D and indicates that this is 100% of your recommended dietary allowance (the USDAs current recommendation, which is twice the 200 IU recommended by the Institute of Medicine [IOM] for all children and adults up to fifty years old). This is not even half of what you should be getting. And you cant just double or triple up on your multivitamin. This can be dangerous due to the level of vitamin A youd be ingesting. People assume that if you have a well-balanced diet, youre getting all the nutrients you need. There is very little vitamin D from dietary sources. Its principally found in oily fish, mushrooms, or sun-dried mushrooms, and in fortified foods like milk, orange juice, yogurt, some cheeses, and some cereals. But there are only 100 IU in a glass of milk or vitamin Dfortified juice or food per serving. (Trivia: Mushrooms are the only source of natural vitamin D in the produce section. Similar to the way that humans absorb sunlight and convert it to vitamin D, mushrooms contain a plant stoolergosterolthat converts to vita- min D when exposed to light. An increasing number of mushroom growers around the world are now exposing their product to ultraviolet light that produces even more natural vitamin D.) What about fish? A serving (3.5 ounces) of wild salmon can impart 600 to 1,000 IU, but few people eat wild salmon most days a week. A serving of cod liver oil can provide 400 IU per serving, but even thats too low, and few people enjoy downing multiple servings of cod liver oil every day. Its simply not a practical way to get your vitamin D, and you can get too much vitamin A (cod liver oil not only contains vitamin D but also vitamin A, similar to a multivitamin). The sad state of commercial fishing can also lead us astray. A few years ago we compared farmed salmon to salmon caught in the wild. Because wild salmon get vitamin D from the food chain in nature, where there is plenty of vitamin D because phytoplankton and zooplankton photosynthesize it, wild salmon contain high levels of vitamin D. Farmed salmon, on the other hand, are fed pelleted food that has very little basic nutritional value. There is essentially no vitamin D in it. When we compared wild-caught to

farmed salmon, we found that farmed salmon had 10 percent to 25 percent of the vitamin D content of wild-caught salmonnot enough to boost levels to an adequate state. (For a list of dietary sources of vitamin D and their approximate content, refer to the chart on page 227.) To eat a sufficient amount of vitamin D (1,000 to 2,000 IU), youd have to consume three cans of sardines, drink ten to twenty glasses of fortified milk, gulp down ten to twenty bowls of cereal, snack on fifty to a hundred egg yolks, or eat seven ounces of wild salmon for dinner every night. Many Problems, One Solution The inescapable fact is that humans have evolved in such a way as to be dependent on sunshine for life and health. Sunlight is the fuel that enables your body to manufacture vitamin D. When your body is unable to obtain sufficient sunlight, it cant make enough vitamin D on its own. Why does this matter? The short answer is that the benefits of vitamin D to human health are many, varied, and profound. As mentioned in the introduction, its estimated that anywhere from 30 percent to 80 percent of the U.S. population is vitamin D deficient or insufficient. In my opinion, the percentage of vitamin Ddeficient or insufficient citizens is at least 50 and probably closer to 90 percent. The notion that we have to protect ourselves from the sun all the time is misguided and unhealthy. This sun phobia explains why so many people are suffering from conditions related to sun deprivation. When the body doesnt have what it needs to optimize cellular functions and sustain life, the inevitable decline that follows often manifests itself in exactly the kinds of illnesses and diseases that we hear and read about (and fear) daily, such as heart disease, cancer, diabetes, arthritis, osteoporosis, and dementia, to name just a few. These ultimately lead to a loss of independence and a lower quality of life. Ive touched upon a lot of issues in this chapter in broad strokes as a swift prelude to the balance of this book, which will take you deeper into the vitamin D story. What I havent mentioned, however, is that we can trace our relationship to vitamin D back millions of years to a time when humans had yet to make an appearance on the planet. Vitamin Ds legacy begins when earth and its inhabitants looked vastly different from how they look today. Casting back to that time period allows us to see why and how we evolved the way we did and admire the ingenious making of not only the human body, but every body that sports a spine. Revue de presseFollowing Dr. Holick's advice about vitamin D is possibly the single most important thing you can do to improve your health and save yourself from many chronic diseases, including cancer.David Servan-Schreiber, M.D., Ph.D., author of international bestsellers The Instinct to Heal and Anticancer: A New Way of Life Dr. Michael Holick has been a hero of mine for many years. How thrilling to have his ground-breaking research on vitamin D in one easily accessible book. This information can save your life. Really."Christiane Northrup, M.D., ob/gyn physician and author of the New York Times bestsellers: Women's Bodies, Women's Wisdom and The Wisdom of Menopause Dr. Holick shows us why if you do one thing for your health beside eating well and exercising it MUST be getting more vitamin D through sun or supplements. Vitamin D deficiency affecting 200 million Americans is not just important for building strong bones but is absolutely needed to prevent and treat our chronic disease epidemic including heart disease, cancer, diabetes, depression, obesity, and autoimmune disease. The Vitamin D Solution, written by the worlds leading authority on vitamin D will surprise and delight you.Mark Hyman, MD, leading authority on nutrition and health and four time New York Times best-selling author including The UltraMind Solution and winner of the Linus Pauling Award. Dr. Michael Holick's The Vitamin D Solution is an essential guide for women and men of all ages. As the leading vitamin D researcher in the country, Dr. Holick provides clear, practical, and scientifically based advice to help you improve your vitamin D nutrition and overall health.Miriam E. Nelson, Ph.D., associate professor, Friedman School of Nutrition Science and Policy, Tufts University and the author of the bestselling "Strong Women" book series I'm very pleased with the information presented in Dr. Holick's The Vitamin D Solution[he] provides an understandable, well-written, and highly informative presentation about this unique vitamin, its history, its very important functions, problems with deficiency, and the steps to rebuild Vitamin D levels.Diane Kress, R.D. CDE, author of The Metabolism Miracle