

VITAMIN D:

The Complete Consumer's Guide



By Ken W. Peters

Edited by Dr. Joycy D'mello, M.D.

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Table of Contents

[Chapter 1: The Sunshine Vitamin](#)

[Chapter 2: Vitamin D Deficiency](#)

[Chapter 3: Optimal Blood Levels of Vitamin D](#)

[Chapter 4: Testing for Vitamin D](#)

[Chapter 5: Vitamin D2 vs Vitamin D3](#)

[Chapter 6: Obtaining Vitamin D from Food](#)

[Chapter 7: Do We Need Vitamin D Supplements Year Round?](#)

[Chapter 8: Avoiding Vitamin D Toxicity](#)

[Chapter 9: Disinformation on Vitamin D](#)

[Conclusion](#)

Chapter 1

The Sunshine Vitamin

What Is Vitamin D?

Vitamin D is a fat-soluble nutrient that functions as both a vitamin and a hormone. The uniqueness of this vitamin is in its ability to turn into a hormone, known as active vitamin D, or Calcitriol, in the body through chemical processes. Active metabolites of vitamin D are produced in the liver and kidneys. These metabolites work to bring about normal functioning of other tissues, primarily the intestinal mucosa and bone tissue.

Vitamin D is also known as the “sunshine vitamin”, as sunlight is the chief source of this vitamin. Although, in the past, it was referred to as the “anti-rachitic vitamin” due to its use in the treatment of rickets, a disease that makes bones soft and bendable, leading to bowed legs, knock-knees, and other bone malformations. However, these days the winter blahs, or a longing for a sunny tropical vacation, could be a more modern indicator of a vitamin D deficiency. It is estimated that as many as 80% of Canadians may have dangerously low levels of vitamin D, especially during the long Canadian winters.

Dr. William Finn, a vitamin D expert at the University of North Carolina, justly states, ***“There is no question that vitamin D deficiency is an epidemic in the U.S.”*** This statement beyond doubt portrays the importance of this vitamin in a few words.

Vitamin D from the Sun

It was previously assumed that a daily 10-15 minutes exposure to sunlight was sufficient to fulfill individual vitamin D requirements. However, this belief is essentially inaccurate, unless one is to run about

naked and dirty under the sun.

Making vitamin D from the sun is not as simple as it may appear. This is a volatile and lengthy process involving a number of steps. Firstly, the ultraviolet rays present in sunlight irradiate the oils produced by the skin, to convert an inactive sterol obtained from cholesterol to cholecalciferol, or Vitamin D3. This compound then enters the bloodstream through the skin and is converted to calcidiol in the liver. When calcidiol reaches the kidneys, some of it is converted to calcitriol or activated vitamin D. Calcitriol travels through the bloodstream to function as a hormone, and regulates bone growth and development, in addition to bringing about some neuromuscular and immune functions.

Calcitriol is basically what is referred to as vitamin D, in general. Although the creation of vitamin D from sunlight seems like a straightforward process, it often encounters a number of hindrances, including natural skin pigments and synthetic sun blocks, which screen out the much-needed ultraviolet light.

Sun blocks with an SPF as low as eight, can restrain more than 95% of vitamin D production in the skin. Clothes, smoke, fog, smog, and most glass, screen out UV light, interfering with vitamin D formation. And then there is the daily shower. The hot, chlorine and detergent-infused water manages to wash away all the oils from the skin surface, required for the initiation of vitamin D production. Applying a moisturizer to replace the skin oils, or sebum, does not serve the same function as the natural oils in this regard. This is because the moisturizer is chemically different from naturally produced sebum, which is a cholesterol-based skin oil.

It is estimated that a Caucasian (who avoids bathing before exposure to sunlight) could generate sufficient vitamin D by exposing 50% of his/her skin to noontime sunlight for 15 minutes, on a clear day. Those with darker skin require closer to 25 minutes under similar conditions. However, in Canada there are just about 4 months in a year when the rays are strong enough to produce vitamin D in this manner.

Vitamin D Does More Than Just Build Bones

Up until recently, researchers and medical practitioners believed that vitamin D was only required to increase the absorption of calcium and its deposition in the bones. However, this essential vitamin does have other health benefits too. Some researchers discovered that individuals living below the equator had very little incidences of Multiple Sclerosis. Yet, when these people moved north of the equator, the number of them affected with MS rose to the same as those residing in the northern countries.

Several other studies have also confirmed this link between vitamin D deficiency and MS. One of these studies, published by The Journal of the American Medical Association in 2006, observed blood samples of the members of the U.S. Military. This study showed that individuals in the study group with higher levels of vitamin D were 62% less likely to develop M.S. in comparison to those with lower levels. However, no such link was found among blacks and Hispanics, perhaps because there were very few of them in the study, in addition to light skin being able to absorb sunlight better than the pigmented dark skin.

Lately, the supplement form of vitamin D is being prescribed for a wide range of ailments, including low energy, depression, and joint pains. Concurrent with latest research regarding this vitamin, more and more ailments are being added to this list, including some forms of cancer. It is now believed that an adequate intake of vitamin D can prevent or reverse most of these diseases. Even celiac disease (gluten-sensitivity), is believed to be indirectly linked to a deficiency of vitamin D.

Not long ago, researchers at the University of California, San Diego, found that skin normally holds a fair bit of inactive vitamin D. This inactive form is converted to vitamin D3 when microbes and bacteria attack the skin, in order to defend the skin against these invaders. In relation to this study, Dr. Richard Gallo says, "Our study shows that skin wounds need vitamin D3 to protect against infection and begin the normal repair process."

Psoriasis, an autoimmune disorder of the skin is often treated with ultraviolet light. Some early research also found that patients with psoriasis often have low blood levels of vitamin D. In line with this research, application of vitamin D topically, or locally to the psoriasis patches on the skin, has proven effective in reducing its symptoms.

In addition, it has also been established that vitamin D helps fight infectious diseases of the lungs such as influenza, and tuberculosis.

It is because of these more recent studies that vitamin D has gained prominence lately for the acquisition and maintenance of good health, and its importance is no longer limited to healthy bones.

Vitamin D and Cancer

Low vitamin D levels have also been linked with prostate cancer. In fact, here's what Haojie Li, MD, PhD, a research fellow at Brigham and Women's Hospital, and Harvard University School of Public Health, had to say in a news release about his research: "Our findings suggest that vitamin D plays an important protective role against prostate cancer, especially clinically aggressive disease. This research underscores the importance of obtaining adequate vitamin D through skin exposure to sunlight or through diet, including food and supplements." Haojie Li's study also found that men with the highest levels of vitamin D in the study group had an approximately 45% lower overall risk of developing prostate cancer.

Currently, a study is under way to test a high dose vitamin D product (DN-101: Calcitriol), in conjunction with a chemotherapy drug, for treating those with prostate cancer. The researchers hope to increase survival rates and improve the quality of life in the cancer patients being studied. They have already noted that the patients have found chemotherapy easier to tolerate with this novel product.

Another study, published by the American Journal of Preventive Medicine, explored the link between blood levels of vitamin D and the risk of colon cancer, observing 1500 individuals over 25 years. They found that a daily intake of 2,000 IU of vitamin D3 could reduce the

incidences of colorectal cancers by two-thirds. Earlier studies have also observed that the death rates from breast, colon, ovarian, and prostate cancer were considerably lower in countries with sunnier climates. A breast cancer study by Dr. Cedric Garland, and his associates, also found that individuals with the highest blood levels of vitamin D had the lowest risk of developing breast cancer.

Dr. Cedric Garland went so far as to state that it has more potential than any other vitamin or micronutrient to prevent cancer. He also suggests that by taking 2,000 IU of vitamin D3 daily or by even spending 10-15 minutes in the sun daily, one could maintain a level of vitamin D in their bloodstream, ideal for a 50% reduction in their risk of developing breast cancer. Though, as mentioned before, it is not quite that easy to get enough vitamin D from the sun.

For years, researchers and healthcare providers have advised against too much exposure to sunlight to avoid skin cancer. Ironically, it now appears that vitamin D deficiency may also be linked with skin cancer, in addition to the forms of cancer mentioned above.

Although, these studies are still in their early stages, with further research and corroboration they can certainly lead to useful medical advances. Meanwhile, the importance of vitamin D and its utilities are on an upward spiral, with plenty of new research pointing to its usefulness in diseases control.

Supplementing With Vitamin D

For every argument advocating the use of Vitamin D in supplemental form, there is a counter argument to try to get more of it from sunlight and food.

Generally, supplemental vitamin D contains ergocalciferol (D2) obtained from irradiated yeast, or cholecalciferol (D3) obtained from irradiated sheep's wool, or fish liver oil. However, D3 is more beneficial than D2 in fulfilling the vitamin D requirements of our body, since D3 is the vitamin D metabolite naturally produced in the skin, and it is what actually converts to calcitriol, or activated vitamin D. As far as dietary

sources of vitamin D go, most foods do not provide much, but we will have a closer look the food sources of vitamin D later on.

The medical profession maintains that taking more than 2,000 IU of vitamin D per day can cause the body to absorb excessive calcium, possibly damaging the kidney and liver. Certainly in those prone to kidney stones, high vitamin D levels can elevate their risk, due to subsequent increase in the level of oxalates in their urine. On the other hand, those naturally treating conditions of Multiple Sclerosis take around 6,000 IU of vitamin D per day.

Moreover, the late Dr. Abram Hoffer, a pioneer in the field of “orthomolecular nutrition”, used to advise some of his patients with depression to take 10,000 IU of vitamin D per day, throughout the winter, suggesting that it is the equivalent of a tropical holiday. Nevertheless, supplementing with high doses of vitamin D requires additional nutrients such as vitamin A and K2 for the purpose of safety. We will explore this point in detail further in this book.

Obvious vitamin D toxicity in adults occurs when they take 100,000 IU daily, for a few months. Yet, in the only documented case of pharmacological overdose, a man inadvertently took between 156,000 IU and 2,000,000 IU daily for 2 years. Once properly diagnosed, he recovered uneventfully, after treatment with steroids and sunscreen (www.vitamindcouncil.com). To put the amounts of vitamin D required into perspective let us first consider what nature provides. A vitamin D-deficient human will make at least 10,000 IU of vitamin D, within 30 minutes of full-body exposure to the sun.

To confirm a vitamin D deficiency doctors advise certain blood tests, which measure the vitamin D metabolites in an individual’s blood samples. Almost every scientific article ends with a warning to avoid the self-prescription of vitamin D, also indicated by the following quote of Dr. Kim Chi (working on the aforementioned new vitamin D-related drug for treating prostate cancer): “We don’t want people heading out there and taking boatloads of vitamin D. It can be very toxic and life-threateningly toxic.”

However, consider the many pharmaceutical drugs casually dumped in the market today, to be sold over the counter, or even readily prescribed by physicians, until their dangerous side effects start showing. Most nutrients hardly pose threats of a similar magnitude due to self-prescribing. Apart from deaths due to iron overdose in children, before the entry of childproof lids, vitamin overdose has led to negligible or no deaths in the last decade. This is much more positive than the 106,000 deaths in the U.S. due to prescription drugs annually.

Chapter 2

Vitamin D Deficiency

Who can be Deficient in Vitamin D?

A number of factors can tip the balance of vitamin D in the human body. As this vitamin is synthesised inside the body, this process depends on several aspects, including skin type, age, underlying illnesses, body weight, and most importantly, amount of exposure to sunlight. A disparity in any of these factors, can lead to deficient levels of vitamin D. Following is a list of causes and risk factors of vitamin D deficiency.

People who don't get enough sunlight:

Such individuals are generally deficient in this essential nutrient. In Canada (or in a temperate zone climate) there are roughly 4 months in a year, during the summers, when people can get enough vitamin D from the sun. Even during these months, to make adequate vitamin D, exposing one's bare arms and legs to direct sunlight, without applying sunscreen, and without being too well washed, is required. Exposing the face to sunlight is of no consequence, as the facial skin barely produces any vitamin D.

Obesity:

Obese individuals require higher amounts of vitamin D. People who are obese have so much body fat that the vitamin D gets trapped in this fat, and is no longer bio-available. Some studies compared the vitamin D levels in the blood samples of obese adults and normal weight individuals, after exposure to similar amounts of ultraviolet light, or intake of the same oral doses of vitamin D. This comparative study showed that the obese adults had less than half the amount of vitamin

D in their bloodstream, as compared to the normal weight individuals. Therefore, obese people need to ingest at least 2 to 3 times more vitamin D than the average weighted person does, in order to attain the same blood levels. This also implies that those who are overweight, without being obese, perhaps require a little more than the average amounts of supplemental vitamin D too.

Aging:

Elderly individuals have thinner skin. This literally means that their body is unable to produce as much vitamin D as it did when they were younger. Hence, the elderly require extra sun exposure and/or supplementation. Very often, elderly or geriatric individuals get lower amounts of sun exposure, as they remain indoors for the most part of the day, especially if they are unwell or bedridden. As a result, when we compare the amount of vitamin D made by a 70-year-old, with that of a 20-year-old, we find that the 70-year-old only makes about 25 % of the vitamin D that the 20-year-old makes.

Dark-skinned people:

Dark-skinned individuals are more likely to suffer from vitamin D deficiency, as their skin blocks ultraviolet light. Hence, they require much more sunlight to produce the same amount of vitamin D as a fair-skinned person.

Breastfed babies:

Babies that are exclusively breastfed are likely to be deficient in vitamin D, as breast milk does not contain vitamin D. Pediatricians generally recommend a vitamin D oral supplement for babies on breast milk alone. It is also important for the lactating mother to take vitamin D supplements too.

Underlying kidney disease:

People suffering from advanced kidney disease, especially those requiring dialysis, are unable to convert calcidiol to calcitriol, or activated vitamin D, due to impaired kidney function. Such people

require oral supplementation of vitamin D to avoid its deficiency.

In general, people who do not take vitamin D supplements have a considerably increased likelihood of being vitamin D deficient, unless of course they live in a sunny climate, and sunbathe regularly. It is also almost impossible to get enough vitamin D from food alone. (More on food sources of vitamin D to follow.)

What Are The Symptoms of Vitamin D Deficiency?

Vitamin D deficiency symptoms can be as vague as fatigue and general aches and pains. In fact, some people may not show any obvious symptoms at all. However, even in the absence of overt signs, an underlying deficiency in vitamin D can increase the possibility of a number of health risks. Here is an overview of the most common ailments linked to vitamin D:

Acne

Anaemia

Asthma and respiratory diseases, in both adults and children

Autism

Cancer (breast, colon, lung, lymphoma, prostate)

Cardiovascular disease, and High Cholesterol

Chronic itch, and Hives

Crohn's Disease, and IBS (Irritable Bowel Syndrome)

Dental cavities, and Periodontal disease

Depression, and SAD (Seasonal Affective Disorder)

Diabetes

Ear infections in children

Fibromyalgia, Muscle weakness

Hypertension

Impaired Immune Function, leading to frequent infections, colds, and flu

Infertility

Inflammation

Multiple Sclerosis

Osteoporosis

Psoriasis

Rickets in children

Schizophrenia

Vitamin D along with a few of its co-factors (especially vitamin A, Iodine and B-12), is responsible for building and maintaining the lining of the mucosal membranes in the body. Thus, a deficiency of vitamin D, and/or its co-factors, can contribute to problems in this area. This includes problems related to the intestinal tract (IBS, digestive disorders, food allergies), lungs (lingering coughs), sinuses (repeated infections, allergies) and bladder (repeated infections, interstitial cystitis).

Chapter 3

Optimal Blood Levels of Vitamin D

Knowing how much Vitamin D you require is essential to ensure good health, and ward off disease. But, how much vitamin D does an individual really require to avoid deficiencies? Moreover, how does one actually avoid overdoing the sunbathing and supplements?

In scientific terminology, 25(OH)D refers to 25-hydroxyvitamin D, the form of vitamin D ideally measured in the blood, expressed as ng/ml. The medical fraternity considers the normal range of 25(OH)D to be between 30-74 ng/ml. Generally, any value below 20ng/ml is recognised as vitamin D deficiency, and calls for immediate medical intervention with supplements.

An Expert's Opinion: Ideal Blood Levels of Vitamin D

In 2010, Life Extension Foundation published an interview with Dr. Michael Holick, the world's foremost researcher on the benefits of vitamin D. Michael F. Holick, PhD, MD, is a professor of medicine, physiology, and biophysics at Boston University Medical Center, and the director of the General Clinical Research Unit there. He is directly, or indirectly, responsible for most of the studies researching how the genetic receptors found throughout the body use vitamin D to reduce the risk of cancer, depression, diabetes, and heart disease.

In his book "The Vitamin D Solution", Dr. Holick recommends to maintain a blood level of 25-hydroxyvitamin D between 40 and 60 ng/ml. It is within this range that most of the health benefits occur. To attain this, Dr. Holick says that he practices sensible sun exposure

when the sun provides sufficient light to make vitamin D in the skin, in addition to taking 2,000 IU of vitamin D as a supplement, and a multivitamin with 400 IU of vitamin D daily. He also drinks three glasses of vitamin D fortified milk every day. With these simple steps, he manages to maintain his 25-hydroxyvitamin D levels in the range of 40-50 ng/ml.

[Life Extension Magazine September 2010](#)

Vitamin D and All-Cause Mortality

Here is what other researchers have to say about optimal vitamin D amounts for general health and longevity, in comparison to Dr. Horlick's recommendations.

A research paper titled "Vitamin D and All-cause Mortality" evaluated more than 3,000 subjects and concluded that serum levels of vitamin D at less than 20 ng/ml "were associated with an almost 2-fold increased risk of all-cause mortality compared to patients with 25(OH)D levels greater than 30 ng/ml." All-cause mortality is the number of deaths regardless of the disease, occurring annually in a given age group, in relation to the total population belonging to that particular age group.

[Vitamin D and Major Chronic Illness PDF](#)

A data analysis of more than 13,000 adults in the National Health and Nutrition Examination Survey, found that subjects with 25(OH)D levels less than 17.8 ng/ml were likely to have a 26% increased risk of mortality, compared to individuals with 25(OH)D levels more than 32.1 ng/ml.

Yet another study, covering nearly 11,000 subjects, further confirms this statistical trend. In this study, 25(OH)D levels less than 30 ng/ml were associated with a 1.5 times increased risk of all-cause mortality, when compared to patients with levels greater than 30 ng/ml. On the other hand, vitamin D supplementation ranging between 1000 IU/day to 50,000 IU biweekly was associated with a 60% reduction in the risk of

all-cause mortality. The researchers concluded that the intake of ordinary doses of vitamin D supplements could be associated with a decrease in the overall mortality rates.

These mortality studies indicate that even low doses of vitamin D supplements can help improve the quality of life in a statistically significant manner, by reducing the risk of developing certain diseases.

Although, it is safe to take 1,000 IU to 2,000 IU of vitamin D3 in supplemental form on a daily basis, to know if more is required, one needs to get a blood test.

High Doses of Vitamin D3

Though the therapeutic power of higher than normal doses of vitamin D are sometimes recommended, extremely high levels of a single nutrient can lead to problems down the road. Such problems often arise from the fact that all nutrients have co-factors. Therefore, taking unnaturally high amounts of one nutrient through supplements can deplete the body of other vital nutrients. Vitamins K2 and A are vitamin D co-factors, and have been explained in detail in a following chapter. It is prudent to consider taking these co-factors along with the vitamin D supplements, especially when taking more than 3,000 IU daily.

Some people choose to take 5,000 IU of vitamin D or more, daily to treat ailments, or just because they believe some of the enthusiastic proponents of higher doses. After all, taking supplements is much like belonging to a religion, similar to trusting the conventional medical system. One either believes or does not believe, often strongly. A piece of practical advice for people who follow the high dose proponents is that they test their vitamin D blood levels at least once or twice a year, just to ensure they are not overdosing with too much of a good thing.

A vitamin D blood test can be done through a doctor, or with a home-kit. Both methods of testing are considered accurate, but it is important that the test measures 25(OH)D or 25-hydroxyvitamin D levels. Another type of blood test for vitamin D is called 1,25(OH)₂D, or 1,25-dihydroxyvitamin D test, but the 25(OH)D test is the only one that gives

accurate information about vitamin D. The next chapter elaborates the difference between these two tests, and the reason why 25-hydroxyvitamin D is preferred.

Chapter 4

Testing for Vitamin D

A blood test is the only sure-fire way of knowing if an individual is making enough vitamin D, and if this amount really meets his/her body's requirements. That takes the guesswork out of the equation, and truly presents a fair picture of how much vitamin D supplementation is essential and safe.

Understanding Your Vitamin D Test Result

To comprehend how much of vitamin D is enough, how much is ideal, and how much is too much, it is important to know and to understand the normal values of vitamin D. The 25-hydroxyvitamin D or calcidiol, a metabolite or precursor of vitamin D, is its major circulating form in the bloodstream. Hence, the vitamin D test checks for this metabolite in the blood samples.

Another metabolite of vitamin D, 1,25-dihydroxyvitamin D, is also sometimes measured. But, this test is not used when checking for general vitamin D levels, and deficiencies. 1,25-dihydroxyvitamin D only comes into the picture when a person has abnormally high calcium levels, or a disease that results in increased vitamin D levels, such as sarcoidosis and lymphoma. Often, people confuse these two tests. However, always remember that 25-hydroxyvitamin D is most applicable when checking for vitamin D levels and deficiencies.

In his book "The Vitamin D Solution", Dr. Holick recommends maintaining a blood level of 25-hydroxyvitamin D between 40-60 ng/ml, and The Vitamin D Council suggests that 50 ng/ml is the ideal level. These figures are consistent with what doctors and pathologists consider as normal vitamin D levels, which are anything between 30-74 ng/ml. Ideally you do not want to have a blood level of over 100 ng/ml,

and anything over 150 ng/ml is considered dangerous.

Vitamin D test results show values in units of ng/ml or nmol/L. In the U.S. health professionals use ng/ml, whereas elsewhere in the world (and Canada as well), the nmol/L unit is used.

Here are all the relevant values presented in a table for better understanding:

Name of the test	Normal values	Ideal range of vitamin D	Vitamin D deficiency	Vitamin D toxicity
25-hydroxyvitamin D	30-74 ng/ml (75-185 nmol/L)	40-60 ng/ml (100- 150 nmol/L)	< 20 ng/ml (< 50 nmol/L)	> 100 ng/ml (> 250 nmol/L)

To convert a test result measured in nmol/L to ng/ml; divide the nmol/L value by 2.5. For example, 50 nmol/L is the same as 20 ng/ml ($50 \div 2.5 = 20$).

Interpreting the vitamin D test results:

If the 25-hydroxyvitamin D numbers are too high, odds are that the person is taking way too much vitamin D, and the answer is to simply stop for a while. Many scientific studies have been done where subjects are injected with huge amounts of vitamin D (50,000 IU to 150,000 IU), and left to ride it out for weeks, or months to come.

But, if these abnormal values are excessively high, or accompanied by serious health issues, it is prudent to follow up with a blood test for calcium to check for hypercalcemia (excessively high calcium levels). In the presence of hypercalcemia immediate consultation with a healthcare provider for appropriate medical measures is advised, as it is a potentially dangerous condition. The dangers of too much Vitamin D are discussed in detail in chapter 6.

On the contrary, low 25-hydroxyvitamin D levels warrant an analysis of how much vitamin D is required to get the individual into the ideal range. Fortunately, that information is available through another vitamin D advocacy group (akin to The Vitamin D Council) known as “Grassroots Health”. They offer a free chart on their website that indicates just how much vitamin D supplementation is required, in order to make it to the ideal range. For example, an individual with a reading of 20 ng/ml, and weighing about 150lbs, would require an average intake of 4300 IU of vitamin D3 daily, in order to raise the blood level to 50 ng/ml. Here is the link to this useful chart, [GlassRoots Health](#)

Vitamin D Testing in Canada

When the news about all the benefits of vitamin D started spreading through the mass media, medical requests for vitamin D blood tests increased sharply. The demand for such tests in Ontario went from 29,000 in 2004 to more than 700,000 in 2009. Whereas, B.C reported a 10-fold increase in testing over the last 5 years, and Calgary (Alberta) showed a 400% increase in the number of tests within 2

years.

This lead to an increased strain on the medical budget, compelling most of the provinces to put restrictions on these tests, so that now they can be ordered only when a doctor suspects a serious deficiency. Provinces restricting access to the vitamin D blood test currently include Alberta, B.C., Labrador, Manitoba, Newfoundland and Ontario. The B.C. Ministry of Health also states that: “Measuring serum vitamin D as 1,25-dihydroxyvitamin D[1,25 (OH)₂-D] is seldom indicated, except in selected patients with advanced renal failure, mineral and/or bone diseases. Specialist consultation should be considered for patients with malabsorption, unexplained bone pain, unusual fractures or other evidence suggesting metabolic bone disorder.”

This means that, unless one is at a risk for osteoporosis, or certain specific diseases, if he/she wants a vitamin D blood test, they will have to pay for it themselves. The cost of this test ranges from \$93 to \$32 depending on the province.

At least one doctor voiced displeasure at this restriction of the healthcare providers' inability to screen their patients for vitamin D deficiency. Dr. Linda Rapson, a general practitioner from Toronto, and past-chair of the Ontario Medical Association's complementary medicine section, said: "This is a big mistake. This will be a lost opportunity to promote health and prevent disease. That's what it looks like to anyone who's been following the research literature."

Well, it does look like a “penny-wise/pound-foolish” response from the provincial medical services plans.

Vitamin D Testing in B.C.

As of 2013, the position of the B.C. Ministry of Health is as follows: “Routine serum vitamin D testing or screening for vitamin D deficiency is not recommended...There is no clinical utility in performing Vitamin D tests on patients who are thought to be at risk for sub-optimal vitamin D levels and who would benefit from vitamin D supplementation. Because vitamin D supplementation in the general adult population is

safe, it is reasonable to advise supplementation without testing. Routine testing of vitamin D levels is not medically necessary prior to or after starting vitamin D supplementation.”

[Vitamin D Testing Protocol PDF](#)

Their position that it is safe and reasonable to advise supplementation without testing is fairly logical. However, most doctors still only recommend up to 1 to 2,000 IU of vitamin D daily. Unfortunately they are missing the opportunity to treat and reduce the frequency of more serious ailments, like diabetes, cancer, and heart disease, just to name a few. These are areas where lives can be saved and prognosis of diseases improved, consequently reducing the strain on the medical budget. But, for this kind of high dose supplementation, testing will be required to ensure that such vitamin D therapy is done safely.

LifeLabs (the primary laboratory facility in B.C.), when contacted about getting a vitamin D test, said that a doctor’s referral is required for a 25-hydroxyvitamin D test and, unless the doctor suspects a bone disease, the individual asking for the test would have to pay for the test out of his/her pocket. According to the Ministry of Health, the average cost of a vitamin D blood test in B.C. is \$61.32 (2013).

Naturopaths Offer Vitamin D Testing

A local naturopath (here in B.C.), states that they can offer a vitamin D test with minimal mark-up (15%). This is to encourage people to take this test, especially important if they want to take higher levels of vitamin D, either for treating an ailment, or just for general longevity purposes. The charge is \$69, which may or may not be covered by extended medical, depending on the insurance provider.

Vitamin D Testing in the U.S.

According to Dr. Michael Holick, in the U.S, it can cost up to \$225 for a vitamin D blood test, and Medicare reimburses only forty dollars of that fee. Given the cost, his position is much like that of the B.C.

government: he believes that not everybody needs to be tested, but everybody should be taking a vitamin D supplement.

In the U.S., unlike Canada, one can bypass their doctor and go straight to a testing laboratory. Americans can also order a test online and have the actual blood work done at a laboratory. Some websites that offer this service include: mymedlab.com; healthcheckusa.com; privatendlabs.com.

A 25(OH)D test bought from any of these companies can be done at the nearest LabCorp, though these tests are more expensive than in-home tests.

The Life Extension Foundation offers a vitamin D blood test on their website, which also requires going to a laboratory. While it is not a home test, it is at least cheaper than going through a doctor, in the circumstance that the test is not covered by one's health insurance. Life Extension members pay only \$47 for vitamin D blood testing, as opposed to the approximate \$225 cost Dr. Holick has observed. The cost is \$63 for non-members.

[Purchase Vitamin D, 25-Hydroxy](#)

Vitamin D Home-Testing Kit

In-home tests are now available through the mail, and are easy to use. The test requires only a few simple steps: pricking a finger, followed by putting a small sample of blood on some blotting paper (provided in the kit), and then sent to a laboratory for testing.

One such home test is available through The Vitamin D Council (and they also ship to Canada). The Vitamin D Council works with ZRT Labs, and receives 15% of the proceeds from each test bought, which helps to support the Vitamin D Council (a non-profit organization). A one-test kit is \$65 (US) and a four-test kit is \$220 (US).

[Purchase Vitamin D Blood Spot Test](#)

Participate in a Vitamin D Experiment

Grassroots Health also sells a vitamin D home test kit (\$65 including shipping), but more than that, they offer a chance to participate in a 5-year study designed to observe vitamin D levels amongst a wide group of people, and track health issues associated with vitamin D deficiency.

They offer two options for enrolment, the “D*Action” project for a 1-time only test, or the 5 year project, where the participants have to provide their health information, along with taking a vitamin D test every 6 months, for a 5 year period.

There is a \$65 fee every 6 months for participants in the 5-year project, which includes a new test kit, a new questionnaire entry, and a reporting of results back to you every 6 months. They also send a follow up email every 6 months reminding the participants when it is time for their next test and health survey.

With this large-scale study, the D*Action project is “expecting to demonstrate the significance of this nutrient on many people's health and, of course, in the prevention of many diseases.”

Chapter 5

Vitamin D2 vs Vitamin D3

The Two Forms of Vitamin D

As a supplement, vitamin D comes in two forms:

Ergocalciferol (vitamin D2), prepared from ultraviolet irradiation of ergosterol, a form of yeast derived from the mould ergot, or from ultraviolet treated mushrooms.

Cholecalciferol (vitamin D3), prepared from lanolin irradiated with ultraviolet light, or derived from fish liver oil.

While, vitamin D3 is similar to the form of vitamin D produced in the body after exposure to sunshine, the same does not hold true for vitamin D2. Vitamin D2 was first produced and patented in the 1920s, and since then it has been licensed to drug companies for use in prescription vitamins.

The scientific community has generally regarded these two forms as equivalent, but this belief is based on studies related to rickets prevention in infants that were conducted around 70 years ago. On the contrary, recent studies are now proving that D2 is an inferior form of vitamin D, and that D3 is the most efficient form of vitamin D, when it comes to oral supplementation for the maintenance of good health.

Unfortunately, the form of vitamin D used in prescriptions (in North America), is almost always the inferior vitamin D2. Therefore, a prescription for vitamin D, which is the only legal way (in Canada) to get more than 1,000 IU in a serving, may not be as beneficial as just buying D3 over the counter.

What's Wrong With Vitamin D2?

The definitive argument against vitamin D2 comes from within the medical community itself, in the form of a systemic overview of vitamin D studies published in The American Journal of Clinical Nutrition. (The case against ergocalciferol (vitamin D2) as a vitamin supplement, Lisa A Houghton and Reinhold Vieth)

[The Case Against Ergocalciferol \(Vitamin D2\) as a Vitamin Supplement1,2](#)

To quote: “As a result, vitamin D3 has proven to be the more potent form of vitamin D in all primate species, including humans. The case that vitamin D2 should no longer be considered equivalent to vitamin D3 is based on differences in their efficacy at raising serum 25-hydroxyvitamin D, diminished binding of vitamin D2 metabolites to vitamin D binding protein in plasma, and a nonphysiologic metabolism and shorter shelf life of vitamin D2. **Vitamin D2, or ergocalciferol, should not be regarded as a nutrient suitable for supplementation or fortification.**”

Here’s a simple and concise version of what this study concluded:

- The metabolites of vitamin D2 bind with protein poorly. Hence, it is less effectively absorbed than D3.

- 1 unit of vitamin D3 is equal to 4 units of vitamin D2 with regards to their efficacy.

- Once either form of the vitamin D enters the body, it needs to be converted to a more active form of vitamin D for the body to utilize it. Vitamin D3 is converted to active vitamin D, 5 times faster than vitamin D2

- No clinical trials have ever demonstrated conclusively that vitamin D2 prevents fractures, while clinical trials of vitamin D3 have shown that it does.

- “In addition to its lower bioactivity, the poor stability of vitamin D2 is worrisome, particularly upon exposure of crystalline D2 powder to varying temperatures, humidity, or even storage containers.”

-“The poorer stability of and greater impurities in vitamin D2 powders may also lead to a higher risk of toxicity than that associated with the vitamin D3 metabolites.”

Vitamin D2 Lowers D3 Levels

In addition to the poor bioavailability and potential toxicity of vitamin D2, some double blind and placebo-controlled studies have found that taking D2 actually lowers blood levels of D3. (Long-term vitamin D3 supplementation is more effective than vitamin D2 in maintaining serum 25-hydroxyvitamin D status over the winter months. Br J Nutr. 2013 Mar 28; 109(6):1082-8. doi: 10.1017/S0007114512002851.)

[PUB MED.gov](http://pubmed.gov)

One German study compared vitamin D2 with D3 and a placebo, over an 8-week period, during the winter of 2012. The group receiving vitamin D2, showed a significant increase in their blood markers for D2, but surprisingly their blood markers for D3 concentration fell dramatically.

[The Journal of Clinical Endocrinology & Metabolism](http://thejournalofclinicalendocrinology.com)

Vitamin D2 is Linked to Muscle Damage

So, vitamin D2 is poorly absorbed and utilized by the body, and it also reduces levels of circulating D3 in the body. This conclusion was further confirmed by a recent study released in February 2014. However, this study added one further bit of bad news, revealing that vitamin D2 was also linked to muscle damage after intense exercise.

NASCAR pit crew athletes were randomly given either vitamin D2 or a placebo for 6 weeks. Participants engaged in 90-minute eccentric exercise routines, were evaluated with blood samples, and delayed onset of muscle soreness ratings, obtained immediately after exercise, and on Day 1 and 2 after exercise. While researchers believed that taking vitamin D2 would improve performance by reducing inflammation

and aiding in recovery from exercise-induced muscle damage, the results were disappointing.

David Nieman, Dr,PH, director of the Human Performance Lab at Appalachian State University, states, “This is the first time research has shown that vitamin D2 supplementation is associated with higher muscle damage after intense weightlifting, and thus cannot be recommended for athletes. While vitamin D2 levels in the blood increased, we found that levels of the valuable D3 decreased. And to our surprise, those taking vitamin D2 didn’t have just a little more muscle damage, they had a lot more damage.”

[Orthopedics Today](#)

VEGANS and D2

Vegans are opposed to taking vitamin D3 supplements since they are derived from animal products, mainly from either fish liver oil, or lanolin. In case of lanolin, although the sheep are not killed for their wool, it is still unacceptable to the vegan ethos. So, generally, vegans have only one choice, which is vitamin D2, either synthetic ergocaliferol, or sourced from mushrooms. Mushrooms are moderately high in vitamin D, and this amount can be further increased by subjecting them to extra ultraviolet light. Even then, this vitamin D is in the form of D2. And, as this study below illustrates, although this natural form of D2 does not cause muscle damage, unlike the synthetic D2 in the previous study, it still manages to reduce blood levels of D3, and offers no apparent benefits.

The purpose of this study was to determine if supplementation with vitamin D2 would enhance skeletal muscle function, and reduce exercise-induced muscle damage, in high school athletes, who already had low vitamin D levels. Participants were randomly given either Portobello mushroom powder (600 IU vitamin D2), or placebo, for 6 weeks.

The conclusion was, “Changes in skeletal muscle function and circulating markers of skeletal muscle damage did not differ between

groups. In conclusion, 600 IU/d vitamin D2 increased 25(OH)D2 **with a concomitant decrease in 25(OD)D3**, with no effect on muscular function or exercise-induced muscle damage in high school athletes.” (Influence of vitamin D mushroom powder supplementation on exercise-induced muscle damage in vitamin D insufficient high school athletes. J Sports Sci. 2013 Oct 11)

[PUB MED.gov](#)

There is some good news for the vegans, though. A British company has patented a new form of vitamin D3 that is derived from lichen, and it is now available in North America too. Marketed as “Vitashine”, it is the first vitamin D3, extracted exclusively from a plant source and is also endorsed by The Vegan Society (United Kingdom). NutriStart Vitamin Company is working towards bringing this product into the Canadian market in the near future.

Vitamin D3 Does Prevent Muscle Damage

There was a valid reason behind running those studies referred to above, studies designed to ascertain if vitamin D2 could help control inflammation, and reduce muscle damage following exercise. The reason being that other studies (see links below) had already shown that vitamin D3 supplementation, and/or naturally high blood levels of vitamin D3, can indeed prevent exercise induced muscle damage, and control ensuing inflammation.

[PUB MED.gov](#)

[Orthopedics Today](#)

So, the fact that vitamin D2 cannot accomplish what D3 clearly can do, and the fact that D2 lowers levels of circulating D3, should be enough to convince anyone that D2 is best avoided, both as a supplement and in fortified foods.

Chapter 6

Obtaining Vitamin D from Food

In order to get a better handle on how much vitamin D one should supplement with, it is imperative to look at what can be obtained from food sources. Observing which of these foods an individual eats on a regular basis, can give an estimate of how much vitamin D he/she obtains through dietary sources.

Primary Food Sources of Vitamin D

Vitamin D is present in very few food sources, mostly dairy foods, because they are fortified with vitamin D, eggs, cold-water fatty fish, and mushrooms (D2). Moderate levels of vitamin D are also found in organ meats, including kidneys and liver, however, meat organs are not commonly included in the Western diets. Whereas, the vitamin D concentration found in muscle meat, which is commonly eaten in the West, is considerably lower than that found in organ meats.

In addition, cooking damages some of the Vitamin D metabolites present in dietary sources. One study showed that cooking eggs in an oven, at normal temperatures, destroyed 60% of the vitamin D, after 40 minutes of exposure to the heat. On the other hand, Frying which is hotter than baking but is done for a shorter period of time, only destroyed about 20% of the vitamin D, while boiling destroyed only about 15%.

(Technical University of Denmark)

[Cooking and Vitamin D Retention](#)

Foods that contain the most vitamin D

Foods that contain the highest amount of vitamin D are mentioned

below. However, these are ballpark figures, as different sources list slightly different amounts.

Fish

Various types of seafood are high in vitamin D, with the highest levels found in fatty fish such as salmon, tuna, and mackerel. Concentrations of vitamin D are particularly high in fish liver. Raw fish contains more vitamin D than cooked fish, and fatty cuts contain more than lean cuts. Also, canned fish preserved in oil has more vitamin D than canned fish preserved in water.

Cod liver oil has been used as a palliative against cold and flu for centuries. This protection of the lungs occurs because cod liver oil naturally contains very high levels of vitamin A and vitamin D. However, it is wise to check the label before purchasing any cod liver oil brand, as some modern cod liver oil products are devoid of vitamins A and D, and are sold only as Omega 3 fatty acid sources.

<i>Fish type</i>	<i>Vitamin D concentration</i>
<i>Cod liver oil, 1 tablespoon</i>	1,360 IU
<i>Salmon, wild, raw, 3.5 oz</i>	988 IU
<i>Sockeye Salmon, 3 oz cooked with dry heat</i>	794 IU
<i>Canned Sockeye Salmon, 3 oz with bone</i>	676 IU
<i>Pickled Herring, 3.6 oz</i>	680 IU
<i>1 can (171 g) light tuna canned in oil</i>	459 IU
<i>Mackerel, cooked, 3.5 oz</i>	345 IU
<i>1 can (165g) light tuna canned in water</i>	299 IU
<i>1C canned Atlantic Sardines in oil, with bones</i>	287 IU
<i>Sardines, in oil, drained, 1.75 oz</i>	250 IU
<i>Caviar (Black and Red) 1 teaspoon</i>	37 IU

Meat and eggs

The content of vitamin D in meat is low and of little nutritional importance. As for Eggs, Vitamin D is found in the yolk.

<i>Meat and Egg type</i>	<i>Vitamin D concentration</i>
<i>Bologna Pork, 3.6 oz</i>	56 IU
<i>Bratwurst, 3.6 oz</i>	44 IU
<i>Liver, Beef, pan fried 81 g</i>	40 IU
<i>Salami, 1 oz (3 slices)</i>	17 IU
<i>Egg, 1 Large, raw</i>	28 IU
<i>Egg, 1 Large, fried or poached</i>	25 IU

Mushrooms

Lightly cooked white button mushrooms provide the most vitamin D with 27 IU per 100 gram serving. Subjecting mushrooms to ultraviolet light increases their vitamin D content, and such products are now concentrated and marketed in capsules as vegan sources of vitamin D. However, as discussed earlier, mushrooms provide only vitamin D2, which is the inferior form of vitamin D. Thus, we should not really count on mushrooms when we add up our daily intake from foods.

<i>Mushroom type</i>	<i>Vitamin D conc.</i>
<i>Raw mushrooms, 1/2 cup</i>	40 IU
<i>White Button Mushrooms (lightly cooked), 3.6 oz</i>	27 IU
<i>Shiitake mushrooms, 1/2 cup</i>	20 IU

Vitamin D Fortified Foods

Fortified Milk:

In North America, milk is typically fortified with vitamin D, as are most breakfast cereals. Soymilk is also often fortified, in order to make it closer to milk in perceived value. Checking the nutrition labels for exact amounts is a good method of gauging the product's nutritional value and vitamin D content, since there can be a fairly wide variation between different products.

Fortified Dairy Products

If cheese, milk, and yogurt are not fortified, they are normally low in vitamin D, with the exception of butter because of its high fat content. However, consuming sufficient butter to add an appreciable amount of vitamin D to the diet is not a good option, since one tablespoon of butter provides only 8 IU of vitamin D.

Fortified Cereals

Cereals are a breakfast staple in North America, and so most commercial cereals are fortified with essential vitamins and minerals. Fortified cereals can provide up to 342 IU per 2 cups (Quaker Instant Oatmeal), though most are in the range of 200 IU. This can add up to a reasonable amount when the cereal is combined with fortified milk, or soymilk.

<i>Fortified foods</i>	<i>Vitamin D concentration</i>
<i>1 tablespoon of butter</i>	8 IU
<i>Milk, per cup</i>	125 IU
<i>Cheese, 1 cubic inch</i>	6.6 IU
<i>Fortified Soymilk, per cup</i>	120 IU
<i>Fortified cereals, 2 cups</i>	200 - 342 IU

There are two things one must consider when relying on foods fortified with vitamin D.

Firstly, some products use the inferior vitamin D2, which some experts believe should be avoided because of its potential toxic nature. According to both the Canadian and U.S. dairy councils, most dairy products in North America are fortified with D3.

Secondly, when the Boston University School of Medicine tested samples of milk, they found that 8 out of 10 samples contained either 20% less or 20% more vitamin D, compared to the values indicated on their labels. In fact, some of the milk tested contained absolutely no vitamin D. As a result, milk may be an unreliable source of vitamin D, and probably should count for little when adding up the total vitamin D content found in foods that a person eats.

As discussed in chapter 5, many experts believe that there is a big difference between the two supplemental forms of vitamin D, and recommend foods fortified with vitamin D3 instead of D2.

Can Food alone provide enough Vitamin D?

The recommendations for vitamin D intake have seen a significant increase lately. However, it is practically impossible to meet these daily requirements for vitamin D from food alone. This is especially true for those who spend most of their time indoors, and who hardly consume any vitamin D-fortified foods. People falling into these categories will certainly find it difficult to obtain adequate levels of vitamin D without supplementation.

While it is simply not possible to get sufficient vitamin D from food, sensible sun exposure can provide sufficient vitamin D during the 4 months of summer that the Pacific Northwest receives, and of course, year round for those living in sunny climates. As little as 15 minutes of summer sun exposure for a fair-skinned person, and up to a few hours for dark skinned individuals, is sufficient for this purpose. Although, in order to produce adequate vitamin D, a large area of skin must be

exposed, such as the back and legs, rather than small areas, such as only the face and arms.

A combination of sun exposure, and foods high in vitamin D, can give enough sustenance through the sunny times, and even for a while thereafter, since the body stores vitamin D for a few months, drawing upon these stores as required.

Chapter 7

Do We Need Vitamin D Supplements Year Round?

Many people live in areas that do not receive sufficient sunshine year round to meet their vitamin D requirements. And, most city dwellers work indoors 5 days a week, and don't always get time to sunbath on their days off. Some people are not very keen about sunbathing anyways, and besides, to get enough vitamin D from the sun, at least 50% of the body needs to be exposed to direct sunlight. Moreover, having a shower in the morning washes the natural oils off the skin, leaving nothing for the sun to work with. This makes most of the general population eligible for vitamin D supplements, year round.

Evolutionary Requirements for Vitamin D

The premise behind everybody requiring high levels of vitamin D throughout the year is that the genes dependent on vitamin D were established during the early phase of evolution, when humans still resided in Africa. Thus, when human prototypes migrated northward, their need for a high intake of vitamin D was already established. In those days, our Northern ancestors perhaps acquired some vitamin D by eating animal organs and fish, to compensate for what they might have received from sunlight. These days, most people are not so big on eating animal organs, the best food sources of vitamin D (especially fish liver).

Several of the modern health problems occur because most people stopped eating organ meat, especially liver. A diet low in animal organs is not just low in vitamin D, and minerals, that are usually in higher concentration in these organs, but it also deprives the body of vitamin A, because liver was, and still is, the only significant dietary source of vitamin A.

People in the West, are generally deficient in vitamin A, which is crucial for good health (see blogs at www.nutristart.com). A lack of vitamin A (and D) leads to thinning of the mucosal membranes in the body, which can be responsible for many diseases, including ailments of the sinuses, lungs, and intestinal tract.

Alternative health practitioners believe that high levels of vitamin D in supplemental forms require extra vitamin A, for suitable and safe assimilation of vitamin D. (More on this to follow.)

Vitamin D from Sunshine and Food vs Vitamin D from Supplements

When vitamin D is obtained from the sun, it is not technically in an “active form”. It is up to the kidneys to determine how much vitamin D should be activated from its stores in the liver and skin. And they determine this by monitoring the potassium and sodium levels in the blood. These minerals, obtained through the diet found in one’s environment, help the kidneys determine if it is summer or winter. Foods consumed during the winters are generally high in sodium, as meat consumption is high during this time whereas in the summers they are higher in potassium, as the availability of fruits and certain vegetables increases around this time.

Hence, eating out-of-season, and eating foods not grown in one’s locale, can cause havoc in the kidneys ability to produce active vitamin D. For example, eating bananas and oranges (tropical fruits) all year round (in a temperate zone) can prevent conversion of inactive vitamin D stores into the active D3 form. Since these fruits are high in potassium, the kidneys could continue to behave like its summer and inhibit the production of vitamin D3. However, these days the situation is not so bad since most people realize that they need more than the recommended 400 IU of vitamin D daily. As a result, the increased supplementation of vitamin D compensates somewhat for out-of-season eating.

But, the problem is that most people take very high levels of a fully

active form of vitamin D, instead of allowing the body to decide how much it needs, and then activating that precise amount. High doses such as 10,000 IU daily for a week are okay for an initial building up of stores, and improvement of a severe vitamin D deficiency. However, after that, it is better to be a little cautious and stick to a conservative dose of 3,000-5,000 IU daily, in addition to skipping a couple of days a week (like with most supplements).

Those choosing to use higher doses of vitamin D therapeutically, should do so with the advice of a medical professional, and should test their vitamin D blood levels regularly, to make sure that they are not overdosing on vitamin D. Excessive vitamin D3 can cause hypercalcemia, a situation where the vitamin D3 mobilizes too much calcium into the bloodstream. This can be avoided by taking vitamin K2, which like vitamin A is also a co-factor of vitamin D. Vitamin K2 moves the excess calcium out of the blood, and back into the skeletal structure. (More on this to follow.)

Also, people suffering from Lyme disease should take the advice of a specialist, before taking vitamin D, as some theorize that vitamin D can be counter-productive in such people.

How to Avoid Taking Too Much Vitamin D

Nutritional supplements should be regarded more as drugs, and less as food. Dosing with high amounts initially, until the deficiency is treated, and then rolling back to a lower dose, closer to what food might contain in an ideal state (or what sunshine might provide in the case of vitamin D) is recommended. In addition, skipping your supplements on weekends, or any two days of the week, works to remind the body to store the nutrients, and to use them efficiently. This approach also gives the body a chance to use up any excess nutrients, especially those that are not water-soluble, such as minerals, and fat-soluble vitamins (which includes vitamin D).

Co-Factors of Vitamin D

As discussed earlier, the necessary co-factors for vitamin D are

vitamins A and K2.

Some experts now believe that vitamin D toxicity could arise due to a lack of vitamin A. (And the inverse probably holds true as well, that vitamin A toxicity comes from taking high levels of vitamin A, without adequate vitamin D intake.) This makes sense because the form of vitamin D in supplements is “active”, whereas the form vitamin D from the sun is “inactive.”

Vitamin D from the sun is stored in the skin and liver until the body activates it, based on its perceived daily needs. Most food sources contain vitamin D in combination with vitamin A. Thus, nature indicates that vitamins A and D belong together. Whereas vitamin A creates compounds in the body that break down bone (osteoclasts), vitamin D creates compounds that reform bones (osteoblasts). Together they maintain the health and density of the skeletal structure.

Excessive vitamin D will pull too much calcium into the blood stream, ultimately leading to a disease called hypercalcemia, which can cause calcium deposits in the joints and calcification of the arteries. Other symptoms of hypercalcemia include muscle weakness, joint pain, confusion, loss of appetite, lethargy, and fatigue. Too much calcium in the bloodstream, calls for vitamin K2 to move it back into the skeletal structure.

Hence, vitamin D supplementation is pretty much a part of a triune that includes vitamins A and K2. In most cases, by ensuring adequate amounts of vitamins A and K2, higher doses of vitamin D can be taken safely.

A safe, daily dosage of vitamin K2 is around 120mcg in the MK7 form, and up to 45mg in the MK4 form (not available in Canada). Vitamin K2 is crucial for the prevention of both osteoporosis and hardening of the arteries, and so is a safe bet to take, irrespective of the vitamin D3 dosage.

With vitamin A, usually 30,000 IU daily is suggested, decreasing it to 10,000 IU daily, after one no longer squints in the sun (5 days a week).

(For more information on vitamin A and vitamin K2 see blogs at www.nutrstart.com)

Chapter 8

Avoiding Vitamin D Toxicity

How much vitamin D3 is too much? You will find a far different range of recommendations depending on whom you listen to, from the conservative approach of a doctor, to the more up-to-date suggestions of a naturopath, and all the way to high amounts suggested by the enthusiastic believer.

It is important to remember that vitamin D is fat-soluble, which means your body has a hard time getting rid of it if you take too much. Therefore, it is not prudent to take more than 3,000 to 5,000 IU of vitamin D3 on a regular basis and, even then, for not more than 5 days a week. For higher doses, it is better to take supplemental forms of the co-factors mentioned in the previous chapter, along with your vitamin D supplements.

Toxicity of Vitamin D

The aforementioned Dr. Horlick, was part of a study conducted in 2002, which showed that up to 10,000 IU of vitamin D a day for up to half a year can be consumed, without attaining vitamin D toxicity. In his book, *The Vitamin D Solution*, Dr. Horlick recommends that children can be given up to 2,000 IU daily for their first year of life. For children aged 1 to 12 years old, he believes that 5,000 IU of vitamin D daily is safe, and teenagers and adults can safely take up to 10,000 IU of vitamin D a day for up to 6 months, without any worries.

He further states that it is quite impossible to obtain adequate amounts of vitamin D from dietary sources alone. It can also be difficult to make children and teenagers (not to mention some adults) take a vitamin D supplement every day

In this case, vitamin D can be supplemented with one large dose on a weekly, or even monthly, basis, as long as the total dose is equivalent to their daily needs for that period. For example, if an adult requires 2,000 IU of vitamin D a day, then taking 14,000 IU of vitamin D once a week, or 60,000 IU of vitamin D once a month, could maintain the blood levels of 25-hydroxyvitamin D above 30ng/mL (the minimum range necessary for good health, mentioned in chapter 3).

However, these high levels are somewhat debatable, as he overlooks the necessary co-factors that vitamin D requires, when taken in supplemental form. Nonetheless, this does show that a world-renown expert on the subject of vitamin D is confident that supplementing with relatively high doses is quite safe.

The Vitamin D Council Recommendations

According to on-line experts on vitamin D research, The Vitamin D Council, vitamin D toxicity usually occurs in adults if they take 40,000 IU per day for a couple of months or longer, or take an extremely large one-time dose.

They are much more conservative when it comes to dosing children with vitamin D, clearly more cautious than the recommendations of Dr. Horlick (as stated at the beginning of this chapter). In the case of children, it is always better to err on the side of caution, unless under the guidance of a health professional.

Here are their cautions for dosing children:

- For children weighing 25 lbs or less: 2,000 IU/day for over three months is potentially toxic.
- For children weighing between 25 and 50 lbs: 4,000 IU/day for over 3 months is potentially toxic.
- For children weighing between 50 and 75 lbs: 6,000 IU/day for over 3 months is potentially toxic.
- For children weighing between 75 lbs and 100 lbs, 8,000 IU/day for

over 3 months is potentially toxic.

If one wants to try higher levels in children, remember that higher dosage levels for a short period of time (like one week), followed by a roll back to a lower dose, in addition to skipping 2 or 3 days a week as insurance against overdosing, is suggested. However, it is always better to be cautious, and avoid high doses in children.

The ideal blood level of vitamin D that The Vitamin D Council recommends is 50ng/ml; pretty much the same level as recommended by Dr. Horlick. The Vitamin D Council recommends that adults take 5,000 IU/day of a vitamin D supplement, in order to maintain this level.

[Vitamin Council](#)

Chapter 9

Disinformation on Vitamin D

Whenever a supplement proves too effective, the pharmaceutical industry rallies to shoot it down, least it steal business from them. So, it is no surprise that Vitamin D is currently under attack.

Bad Science

“I think vitamin D is introducing a golden age of medicine.”

This enthusiastic quote from Dr. Cedric Garland, professor of preventive medicine, University of California, came in the early days of the new research on vitamin D. Keeping in line with Dr. Garland's comments, advocacy groups such as Grassroots Health are not letting vitamin D be smeared with bad science, but are taking positive steps with their D*Action project. In this project, they are conducting their own studies by involving the public. They may, even successfully avoid allowing vitamin D to be blown out of the water, like what happened with vitamin A.

[GrassRoots Health](#)

Vitamin A, nearly as important a supplement as vitamin D, is today considered by most as a dangerous supplement that can only be taken safely in insignificant amounts. This prevalent attitude is due to disinformation campaigns, and the unquestioning media attention these campaigns gather; to the point that now even many naturopaths believe the bad science about vitamin A. The links below make a point in favour of vitamin A as being both safe and a necessity in the treatment of several ailments.

[Defending Vitamin A Part 2](#)

[Defending Vitamin A Part 3](#)

Vitamin D Under Attack

“Vitamin D supplements don’t help boost bone density in healthy adults” was one recent headline, referring to a study published in The Lancet Medical Journal, conducted by the University of Auckland’s Department of Medicine, in New Zealand. This headline was splattered all over the internet for days afterwards, not to mention countless newspapers, with little or no critical response (apart from the D-specific websites, like The Vitamin D Council).

This study was actually a review of 23 other studies, including 4,082 patients most of them women, taking supplemental vitamin D for an average of two years. The overview found little difference in bone density measured at key points in the skeleton, such as the hip, the forearm or the lumbar spine. The researchers did note a difference in one place, the femoral neck, but said the benefits were not statistically significant.

“The negative findings of our analysis contrast with the widely held perception that vitamin D works directly on bone cells to promote mineralization,” the scientists wrote. “This perception is probably incorrect.”

[Effects of Vitamin D Supplements on Bone Mineral Density](#)

Flaws in the New Zealand Bone Density Study

Let’s have a look at the main flaws in this very unscientific attack on vitamin D.

Firstly, the researchers were looking at a pooling of various studies done all over Europe and the U.S. Accordingly, there is no indication as to how many people were in areas where they received sufficient sunshine for vitamin D production, nor any idea, what their diets might have provided by way of vitamin D.

All these people may have already been deficient in Vitamin D, which is likely since it has recently been shown that vitamin D deficiency is

rampant in even countries with lots of sunshine throughout the year, such as India (80% deficient) and Oman (87% deficient).

[More than 80% of Healthy Indians are Vitamin D Deficient](#)

Since, the locations of the subjects in the studies reviewed are mostly in the temperate zones, the odds are that a good portion of these subjects were already very low in vitamin D. This study states, “Mean baseline serum 25-hydroxyvitamin D concentration was less than 50 nmol/L in eight studies.” This further substantiates the likelihood that the participants already had low vitamin D levels.

As discussed in earlier chapters, experts on supplementing with vitamin D, such as The Vitamin D Council (www.vitamindcouncil.org) and Life Extension Foundation (www.lef.org), believe that vitamin D blood level should be maintained at a minimum of 50 ng/ml. However, the New Zealand study in question here, uses a different measurement. On converting their baseline concentration of 50 nmol/L to ng/ml, we get a relatively low value of **20 ng/ml**, revealing blood levels clearly too low to be of much value in preventing any D-deficiency related ailments.

In almost half of the studies reviewed, the amount of vitamin D given as a supplement was insufficient to make a difference, especially if the subjects were already D-deficient. “In ten studies (n=2294), individuals were given vitamin D doses less than 800 IU per day.” Compare this to the 10,000 IU your body can make from 30 minutes of direct sunlight (with proper sunbathing, at the proper time of day and year), if it is deficient in vitamin D. As another study confirms, 800 IU of vitamin D will not bring blood levels up to the amount necessary for good health and good bone density. “Administration of 800 IU of vitamin D3 during 45 days was more effective than D2 in increasing 25OHD, but both failed to achieve adequate levels of 25OHD (=30ng/ml).”

[PUB Med.gov](#)

Finally, this flawed study looked for existing trials “assessing the effects of vitamin D3 or D2, (both vitamin D metabolites) on bone

mineral density.” As discussed in a previous chapter, many experts believe that vitamin D2 is inactive and relatively ineffective as a vitamin D supplement, and it can reduce blood levels of D3.

In a study reported in the American Journal of Clinical Nutrition, it was concluded that: “However, the inefficiency of vitamin D2 compared with vitamin D3, on a per mole basis, at increasing 25(OH)D is now well documented, **and no successful clinical trials to date have shown that vitamin D2 prevents fractures.**

[The Case Against Ergocalciferol \(Vitamin D2\) as a Vitamin Supplement1,2](#)

So, it is also uncertain what percentage of the studies they looked at, were analyzing blood levels of vitamin D2, a fairly ineffective form of vitamin D.

Counter study

This study also ignores one from the previous year, which found that people 65 and older, who took 800 to 2,000 IU of the vitamin daily, had a 30% lower risk of hip fractures. In that study, it was found that taking less than about 800 IU of vitamin D per day, with or without calcium, had no effect on bone-fracture risk, when compared with taking a placebo or a calcium supplement alone. However, taking 800 IU or more, on a daily basis, decreased the risk of hip fracture by 30%, and the risk of other bone fractures by 14%. "A 30% reduction in hip fracture with an inexpensive and safe intervention such as vitamin D has enormous public health implications," said the lead author Dr. Heike Bischoff-Ferrari, director of the Center on Aging and Mobility at the University of Zurich, in Switzerland.

[A Pooled Analysis of Vitamin D Dose Requirements for Fracture Prevention](#)

A comment from a doctor that wrote an editorial to accompany this positive vitamin D study really hits the nail on the head, and could easily be applied to the flawed study from New Zealand: "All of the problems with previous studies come from a very modest dose of vitamin D. If

you don't give [study participants] enough of the vitamin D, then you won't see an effect.”

Other Negative Vitamin D Studies

Now, let us have a look at another anti-vitamin D spin from the scientific community, again, like the flawed New Zealand study, spread over the internet and throughout the newspapers without question.

One website, reviewing this newer study highly critical of vitamin D, described the situation as such: “Just when it seemed like vitamin D was the new king of dietary supplements...a recent review of hundreds of studies and clinical trials is knocking D off its throne.” Perhaps actually looking at the study in question before dancing on D's grave, would have been a more proper journalistic approach.

This meta-analysis of existing studies on vitamin D, published online (Dec/13) in *The Lancet Diabetes and Endocrinology*, maintained that, although low vitamin D levels are clearly associated with higher risks of a wide variety of diseases, supplementing with vitamin D had little impact on reducing occurrences of these diseases. This overview examined data from 290 observational studies and 172 random trials, all of which used blood levels of vitamin D to measure outcomes.

Their conclusion was that **low vitamin D levels are a result of certain diseases** including cardiovascular disease, metabolic syndrome, depression, multiple sclerosis, and certain cancers, **but not the cause**.

According to the researchers, from the International Prevention Research Institute in Lyon, France, low vitamin D levels are likely caused by disease-related inflammation. Since inflammation is associated with a wide range of diseases, if inflammation itself caused reduced levels of vitamin D in the body, this would explain why vitamin D deficiency appears linked to so many ailments. The icing on the cake is that in their report, the scientists actually advised against supplementing with vitamin D. Dr. Autier, one of the researchers in this study, stated: “Unfortunately, there is probably no benefit to expect

from vitamin D supplementation in normally healthy people.”

Here is some of that study:

“Results from intervention studies did not show an effect of vitamin D supplementation on disease occurrence, including colorectal cancer. In 34 intervention studies including 2805 individuals with mean 25(OH)D concentration lower than 50nmol/L at baseline supplementation with 50µg per day or more did not show better results. Supplementation in elderly people (mainly women) with 20µg vitamin D per day seemed to slightly reduce all-cause mortality. The discrepancy between observational and intervention studies suggests that low 25(OH)D is a marker of ill health. Inflammatory processes involved in disease occurrence and clinical course would reduce 25(OH)D, which would explain why low vitamin D status is reported in a wide range of disorders.”

[Vitamin D Status and Ill Health: A Systematic Review](#)

Levels of Vitamin D Too Low to Prevent Disease

As noted above, 50 nmol/L is equivalent to 20 ng/ml, a value that has been clearly established as too low to maintain bone density. Moreover, 20 ng/ml is far below the ideal blood levels recommended by most vitamin D experts and healthcare providers, who suggest a level of 50 ng/ml to avoid vitamin D deficiency ailments.

On converting the amounts that were given as supplements in the above study from the ug measurement to IU's, it is observed that 50ug is equal to 2,000 IU, and that 20ug is equal to 800 IU. So, for those with a blood level of 20 ng/ml, taking 2,000 IU of vitamin D is insufficient to affect enough of an increase in blood levels to prevent diseases.

As seen in the chapter on Testing for Vitamin D (from the Grassroots website <http://www.grassrootshealth.net/>), a person with blood levels of 20 ng/ml, and an average adult body weight, would need to take

4,300 IU of supplemental vitamin D daily, in order to get into the 50 ng/ml range.

The important points to note out of all this information are threefold:

1. Everyone should get their blood tested to look for vitamin D deficiency (less than 50 ng/ml) before starting self-prescribing vitamin D at levels higher than 2000 IU daily.

2. One should take more than 800 IU of vitamin D daily in case of deficiency, probably at least 2,000 IU, or even more if blood tests do not show ideal levels.

3. Vitamin D supplements should be in the form of D3 and not D2.

Conclusion

Vitamin D does indeed appear to be a miracle nutrient, miraculous not because of drug-like properties, but miraculous because it fills a huge nutritional void. Almost all ailments are due to a deficiency of nutrients and/or an excess of toxins. Our long term deficiency in vitamin D has been running on for perhaps centuries now, passed on from generation to generation. Examples of this are the recent findings that a mother low in vitamin D gives birth to an offspring more prone to conditions ranging from cavities and weak bones, to autism and schizophrenia. The discovery of this widespread deficiency in vitamin D over generations may be the single most valuable medical realization of the 21st century.

Of course, as indicated in the last chapter, the pharmaceutical/medical industry is not going to just stand by and let a cheap nutrient get in the way of the huge profits derived from treating the wide range of ailments linked to D-deficiency. But, as the disinformation campaigns grow, so does the increasingly apparent benefits of taking vitamin D, and the links between D-deficiency and more, and more ailments.

A recent browse through my Google Alerts on vitamin D, showed a growing body of conditions that can be added to the ones in this book. Here, I included those ailments most clearly linked to vitamin D deficiency, but new ones are surfacing, though they still require some more research to be fully confirmed.

Newer research links vitamin D deficiency to: Alzheimer's disease; autoimmune diseases; cognitive impairment (including memory loss); fecal incontinence; heart complications from diabetes; Parkinson's disease; tuberculosis.

In summary, if you were to take only one nutrient it should be vitamin D (and in adequate amounts).

Table of Contents

- Chapter 1: The Sunshine Vitamin
- Chapter 2: Vitamin D Deficiency
- Chapter 3: Optimal Blood Levels of Vitamin D
- Chapter 4: Testing for Vitamin D
- Chapter 5: Vitamin D2 vs Vitamin D3
- Chapter 6: Obtaining Vitamin D from Food
- Chapter 7: Do We Need Vitamin D Supplements Year Round?
- Chapter 8: Avoiding Vitamin D Toxicity
- Chapter 9: Disinformation on Vitamin D
- Conclusion
- Purchase Vitamin D Blood Spot Test

Contents

Chapter 1: The Sunshine Vitamin	5
Chapter 2: Vitamin D Deficiency	12
Chapter 3: Optimal Blood Levels of Vitamin D	16
Chapter 4: Testing for Vitamin D	20
Chapter 5: Vitamin D2 vs Vitamin D3	28
Chapter 6: Obtaining Vitamin D from Food	33
Chapter 7: Do We Need Vitamin D Supplements Year Round?	42
Chapter 8: Avoiding Vitamin D Toxicity	47
Chapter 9: Disinformation on Vitamin D	50
Conclusion	57