

## The Vitamin D Dilemma

Sun protection can have serious side effects

By Jim Gerweck

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**In the autumn of 2007, Julie Sands started to slow down.**

At first Sands, a runner and triathlete from Winter Park, Fla., attributed it to overtraining, the stress of raising



two 12-year-old twin girls, or simply the inevitable wear and tear of competing for nearly half of her 49 years. But as she tried to gear up for the Half Ironman world championships in nearby Clearwater, she realized there was something more seriously wrong.

"I could barely run 8-minute miles on my hard efforts, and that used to be my easy pace," she says. "I was tired all the time, and couldn't recover from my workouts. It felt like I was going in slow motion."

Sands went to see Dr. Ed Lee, an endocrinologist and occasional training partner and competitive rival, thinking she might be anemic. Lee ran a series of tests that came back with normal iron levels, eliminating the anemia hypothesis. But they showed something else: Sands was severely deficient in vitamin D. That seemed particularly ironic, that someone living in the Sunshine State should be deficient in what's known as the "Sunshine Vitamin," but Sands' levels were 19 ng/ml; an optimal level for active adults is considered to be 50 or higher.

She began taking supplements of 1,000 international units a day in December, and soon upped that dosage to 4,000. "By February I started to feel pretty good," she says.

Her results echoed that feeling; she began hitting 6-minute miles in her training, and at the Lake Placid Ironman in June had what she calls "the run of my life," passing 491 people on the final leg and going from 10th to third in her age group to qualify for the Ironman world championship in Kona, Hawaii. There she reprised her tactics from Lake Placid, going from 24th to 14th in her age group on the run and qualifying for Boston with her marathon split.

That was just a few months after Deena Kastor had seen her Olympic hopes dashed when a bone in her foot snapped like a twig just 5K into the marathon in Beijing. Subsequent tests revealed that while her calcium levels were normal, her body was unable to assimilate the bone-building mineral because she too was low in vitamin D, with levels near 15 ng/ml.

In spite of living and training in near year-round sunshine, both Sands and Kastor, who lives in California, weren't getting the exposure to the sun that would produce vitamin D via absorption through the skin. "Since I was 25, I used sunscreen every day," says Sands. Kastor, who's had a long history of bouts of skin cancer, was even more cautious. "Here I thought I was making a healthy choice by wearing sunscreen and hats and clothes with high SPF values, when the truth of the matter is I was causing myself dangerously low levels of vitamin D," she says. The increased awareness of skin cancers, while a good thing in itself, has produced as a byproduct what Lee terms "an epidemic of vitamin D deficiency."

"I've seen it in pro golfers, in 21-year-old motocross riders," Lee continues. "Athletes, who produce so many free radicals and who sweat out a lot of nutrients, may be even more at risk than most." A recent study in the Archives of Internal Medicine claimed that 75 percent of Americans are deficient in the vitamin.

Besides exposure to the sun, there are two other sources of vitamin D-- fish oil and foods that contain high levels of it, either naturally or through artificial fortification.

Children growing up in the '30s and '40s may have had their taste buds scarred by daily doses of cod liver oil, but each tablespoon contained more than 1,000 units of vitamin D. Few parents today would dare force such yucky-tasting elixir on their kids, leaving diet as the final source of vitamin D. Unfortunately, there are a limited number of foods that contain significant quantities, leaving supplements as the last resort for most people.

The commonly cited Recommended Dietary Allowance (RDA) for vitamin D is 400 IU per day, a figure Lee calls "ridiculously low." He explains, "It's the same for a 110-pound woman and a 200-pound man. That makes no sense." He feels that active adults should take at least 2,000 IU a day, and may require two to two-and-a-half times that amount. Also, as you age, your ability to absorb D through your skin diminishes, causing an increased dosage demand. To determine your blood levels, be sure to get a 25-hydroxyvitamin D test,

also called a 25(OH)D. This measures the effective form of the vitamin that can interact with calcium to help bone health.

In addition to strong bones, vitamin D has recently been postulated as a preventive for certain cancers, particularly of the breast, colon, pancreas and prostate. But while those long-term benefits can't be dismissed, runners may be most interested in the faster times and quicker recoveries that someone like Sands experienced.

Kastor, who started running again in November and returned to racing with a win in the Bank of America Shamrock Shuffle 8K in Chicago on March 29, has felt numerous benefits since she's been taking vitamin D supplements.

"My skin feels better, I'm sleeping more soundly, my strength has increased, and I'm mentally alert and physically more charged up," she says. "Some of that might be due to the enforced three-month layoff I had after Beijing, but not all.

"It's amazing how essential vitamin D is to our well-being," she concludes. "It's too bad I had to learn it the hard way."

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*Low vitamin D levels are very likely limiting your running performance, and may compromise your health.*

**Written by: Reyana Ewing, MPH, RD, CLE**

As runners we want to do everything possible to perform well and have a great season. We are meticulous about our training schedules, hydration, sleeping habits, etc. Yet many times we fall short when it comes to nutrition.

### **My Story**

In the summer of 2008 I started to feel rather lethargic during workouts and I struggled to maintain my normal training paces. My recovery from my harder efforts and long runs took longer than usual. I immediately and incorrectly assumed I had low serum ferritin levels indicating iron deficiency anemia.

One colleague to whom I lamented about my chronic fatigue asked me if I had checked my vitamin D levels. "Vitamin D levels?" I exclaimed. I live in California, it is summer, and I am outside way more than the recommended 20 to 30 minutes a day. There is no way I could be vitamin D deficient, especially since in addition to being exposed to sun most days, I eat a very balanced diet that includes a daily multivitamin supplement. However, a visit to my doctor confirmed that my serum 25-hydroxy-vitamin D (25(OH)D) value was dangerously low (18 ng/ml). Normal levels are between 40-70 ng/ml. And for those with chronic diseases such as cancer, heart disease, diabetes, and multiple sclerosis, normal blood levels should be between 55-70 ng/ml. I was shocked.

I immediately started daily supplementation with 1000 IU of vitamin D (Vitamin D3). After 8 weeks, my 25(OH)D level had improved somewhat (28 ng/ml). I did feel slightly better, but I wanted to recover completely, so I upped my dosage to 2000 IU daily. A few weeks later my levels were within the normal range (56 ng/ml). I felt noticeably stronger and was able to hit my usual paces during training. And in October 2008, I set a half marathon personal record.

### **Deficiency**

This was my very first experience with vitamin D deficiency and I have since learned that vitamin D deficiency is becoming an epidemic worldwide, not only in geographic regions where sun exposure is limited. And my discussions with fellow dietitians working with college runners and professional athletes in generally sunny states (Texas and Florida) confirmed the alarming prevalence of vitamin D deficiency across ethnicity and gender.

Athletes who live in northern latitudes (north of 35 degrees), or use sunscreen consistently, perform their sport indoors, or keep their skin covered are at the greatest risk. Melanin affects the production of vitamin D. So those with more melanin or darker skin produce less vitamin D. Since vitamin D is a fat-soluble vitamin, athletes with fat malabsorption problems such as cystic fibrosis, Crohn's disease, and celiac disease are at risk for deficiency. Those who have normal levels typically (around 50 ng/ml) live in sub-equatorial Africa and work outdoors for most of the summer.

Once thought of as being primarily involved in bone development, activated vitamin D (calcitriol), a steroid hormone, is responsible for regulating more than 1000 human genes. Almost every cell in the human body has receptors for vitamin D. Recent research shows that vitamin D deficiency increases the risk of different types of cancer (such as breast cancer and prostate cancer), as well as heart disease, diabetes, depression, autoimmune diseases, hypertension, obesity, gum disease, chronic pain, muscle wasting, inflammation, birth defects, osteoporosis, influenza and colds, etc.

### **Importance for Endurance Athletes**

We are only just beginning to understand the complexity and importance of vitamin D in relation to health. Of importance to athletes is the function of vitamin D as it relates to overall health, bone density, innate immunity, muscle wasting, and exercise-related inflammation and immunity. To train and race optimally, an athlete should not have any nutrient deficiencies.

#### **Bone Health:**

Deena Kastor, Olympic Marathoner, broke her foot in Beijing during the 2008 Olympic Marathon. It was discovered that her calcium levels were normal, but her 25(OH)D levels were reported to be around 15 ng/ml. And Kastor lives in sunny California. Because of an early scare with skin cancer, she is known to apply sunscreen for all of her outdoor runs, thus limiting her ability to manufacture vitamin D from sun exposure. Even with the extensive research to show vitamin D and calcium's role in preventing osteoporosis, elite, college, and high school athletes continue to be deficient in one or both nutrient(s). Stress fractures are quite prevalent in runners and yet so preventable.

#### **Increased VO2 max:**

German research studies dating back to the 1950s show that athletes exposed to vitamin D-producing ultraviolet light had improved athletic performance. Other studies showed that athletic performance peaked at the end of the summer. Peak performance was also associated with 25(OH)D levels around 50 ng/ml. In addition, maximal oxygen uptake was found to drop when less ultraviolet rays reached the earth, for example, in the late fall. This is particularly a problem for marathoners training through the summer for fall marathons.

#### **Reduced Inflammation:**

After intense exercise, endurance athletes experience inflammation due to elevated levels of pro-inflammatory cytokines. Vitamin D reduces the production of these cytokines while increasing the production of anti-inflammatory cytokines, thereby speeding the recovery process between hard workouts.

#### **Improved Immunity:**

In a February 2009 study published in the *Archives of Internal Medicine*, vitamin D3 levels were tested in 19,000 Americans. Those with low levels of vitamin D had the highest incidence of colds and influenza. This is important information for endurance athletes who strive to balance heavy training loads and staying healthy.

## What can be done?

1. Check 25(OH)D levels regularly and supplement as needed.
2. Check for total 25(OH)D and not 1, 25(OH)D, which will tell you nothing about your blood stores. Total 25(OH)D reflects all sources of vitamin D – from food, UV energy (photo-production), and supplementation.
3. Deficient athletes measuring less than 30 ng/ml should supplement with 20,000 IU to

50, 000 IU of vitamin D3 per week for 8 weeks and recheck serum 25(OH)D until normal values are attained.

1. Get regular, safe, twice-daily (5-30 minutes) exposure to sun between the hours of 10 am and 3 pm. Note that sunscreen and glass (being indoors) reduce or block UV energy.
2. Supplement with 1000 IU to 2000 IU of vitamin D3 to maintain normal levels.
3. For those living or competing in northern latitudes (north of Atlanta, GA) little to no vitamin D production will occur, so consumption of fortified foods and supplements is a necessity.

## Food Sources of vitamin D

There aren't many naturally occurring foods that contain vitamin D. Most of the foods containing vitamin D have been fortified, for example milk and certain juices.

**Table 1. Food Sources of Vitamin D**

FOOD	Serving	IU per serving *
Fish liver oils (cod liver oil)	1TBSP	1360
Herring, cooked	3 oz	1383
Wild salmon, cooked	3.5 oz	981
Farm salmon, cooked	3.5 oz	249
Tuna, canned in oil	3.5 oz	200
Milk, non fat, reduced fat, whole (fortified)	8 oz	100
Margarine, fortified	1 TBSP	60
Egg	1 whole	18
Beef, liver	3.5 oz	15
Cheese	1 oz	12
*IU = International Units		

Dietary Supplement Fact Sheet. National Institute of Health (2007)

## Caution

High intakes of vitamin D can cause nausea, vomiting, poor appetite, weakness, and constipation. Current safe upper limits are set at 2000 IU by the National Institute of Health, but there are newer data supporting upper limits as high as 10,000 IU per day.