

Let the sunshine in: We need Vitamin D more than ever by Emma Young

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The sun's rays are even more essential to health than we thought. But how do you know if you're getting enough?

IT IS an annual ritual, as reliable as the spawning of frogs or the return of migrating birds. On the first sunny, warm day following winter, pale-skinned denizens of the high latitudes slough off excess clothing and expose their blanched bodies to the sun's rays.

Most of us love sunshine. Yet the standard health advice tells us to cover up and slather on the suncream for fear of developing skin cancer. That is still good advice, but the latest research suggests that sunshine – or rather the vitamin D it generates – may be more essential for health than we previously recognised.

Most people are familiar with the idea that extreme vitamin D deficiency causes rickets, a softening of the bones that can bow and distort them. It's also known that even a moderate lack of vitamin D can boost the risk of fractures. What's new is the idea that vitamin D is not just about bones. Mounting evidence indicates that if we don't get enough of it, we could leave ourselves more susceptible to infections, increase our risk of autoimmune diseases such as multiple sclerosis and type 1 diabetes, and even raise the risk of certain cancers.

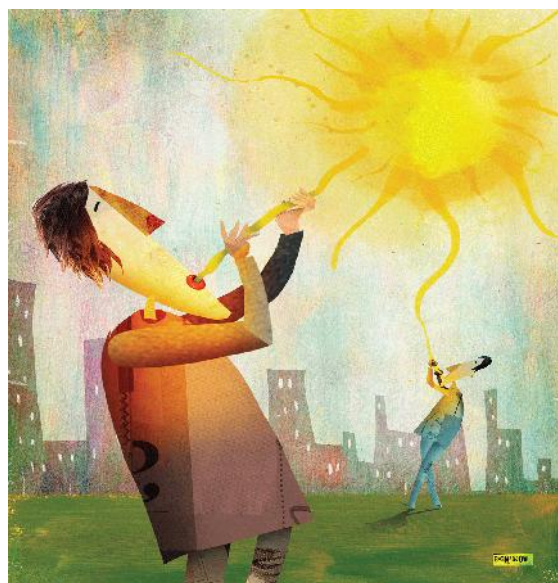
All that suggests a rethink of official advice about how much vitamin D is enough. "The UK guidelines have traditionally been targeted at trying to prevent rickets," says Julia Pakpoor, a vitamin D researcher at the University of Oxford. "Higher doses – perhaps five times higher – are almost certainly safe, and more beneficial." Time to get out in the sun?

We get vitamin D in two ways: by eating it, and by exposing our skin to the ultraviolet B (UVB) rays in sunlight. Technically, vitamin D made in the skin is a hormone, as a vitamin is defined as an organic compound that the body cannot produce in adequate quantities. Cells in the outermost layer of skin, the epidermis, make a substance called 7-dehydrocholesterol, which reacts with UVB light to form a precursor of vitamin D. Our kidneys convert this into the active form, which binds to receptors in the intestines and bones and helps regulate levels of calcium, a crucial building block of bone.

Along with the kidneys, various types of immune cell can convert vitamin D into its active form, and many also possess vitamin D receptors. The first hints that vitamin D might play an active part in the immune system came as early as the 1960s from studies of multiple sclerosis. MS is characterised by the immune system attacking the fatty sheaths around nerve cells in the brain and spinal cord. Epidemiologists noticed that cases seemed to cluster at high latitudes, where people were exposed to less sunshine. "At first, the link seemed kind of improbable," says George Ebers, a neurologist at Oxford. "But gradually, there has been more and more data to support the notion that it has something to do with sunshine."

In 2011, a group led by Steve Simpson at the University of Tasmania, Australia, combined the results of hundreds of studies investigating MS and sun exposure, and concluded that the trend is real, with a few exceptions. Scandinavia, for instance, has far fewer cases of MS than its latitude should predict – but then Scandinavians eat a lot of oily fish, a food packed with vitamin D.

There could be other explanations for this clustering. People living at higher latitudes might have other genetic predispositions that would boost their MS risk, although the team controlled for one



such gene variant. But recent studies of people living in Iran have bolstered the idea that sun exposure is directly involved. From the 1950s through to the 1970s, Iran was a country heavily influenced by the fashions and culture of the West. With the Islamic revolution of 1979, however, that changed. Men dressed more modestly and women covered their bodies almost completely, so skin previously bathed in sun was suddenly in darkness.

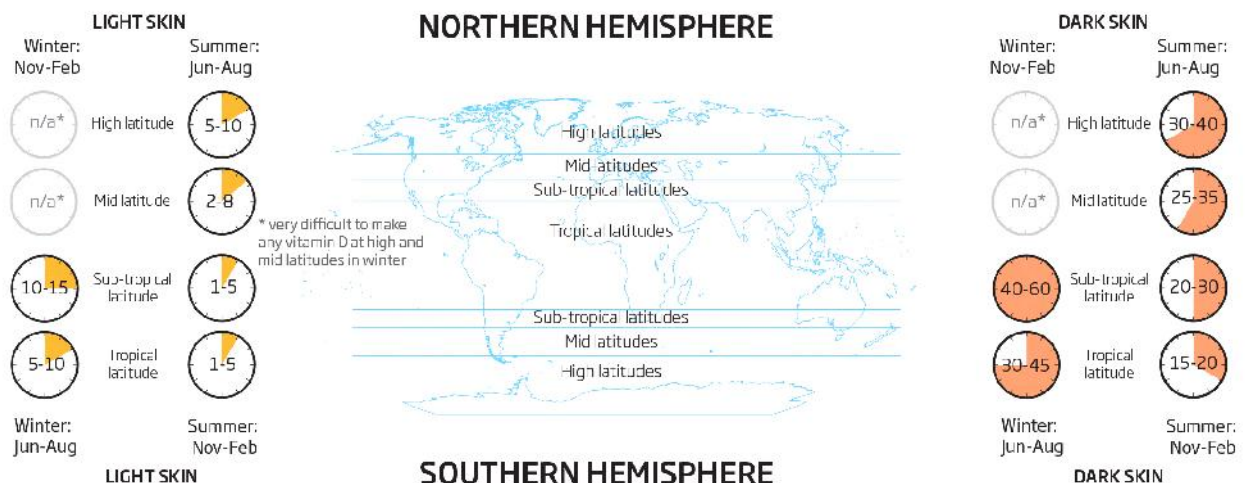
There is no MS data from before the revolution, but the period 1989 and 2006 saw an eightfold rise in cases, to nearly 6 per 100,000 people. "This is a very high, rapid rise," says Pakpoor, especially for such a sunny country. "It must be because of an environmental risk factor, and one that is specific to Iran, because this isn't something we've seen across the Western world," she says. "The only thing I can think of is the revolution."

Protective effects

That's still only a highly suggestive correlation, but there is other evidence. Earlier this year, Alberto Ascherio of the Harvard School of Public Health published data from people with the earliest symptoms of MS, suggesting that those with lower levels of vitamin D in their blood were more likely to develop full-blown symptoms, and to have a poorer prognosis. Ascherio has also reported that young adults with low vitamin D are about twice as likely to develop type 1 diabetes as those with higher levels.

How much sun?

The number of minutes you need to spend in the sun to get your daily dose of vitamin D varies by the time of the year, your skin colour and where you are



It's not yet entirely clear how vitamin D might protect against autoimmune diseases. From his own work on MS, Ebers suspects vitamin D may enhance the ability of immune cells to distinguish between foreign material and the body's own cells. Other research hints at a link with the blood-brain barrier, the protective layer that prevents certain harmful chemicals and cells from reaching the brain. A recent study of mice given an MS-like disease suggested that one kind of immune cell was unable to cross the barrier and mount an attack against nerve cells if the animals' diet was supplemented with vitamin D. When these supplements were stopped, the cells started appearing in their brains.

Whatever the answer, it seems the immune benefits don't stop with autoimmune conditions. Vitamin D also seems to ramp up the body's defence against viruses, including those responsible for causing flu and colds. Possibly it increases the production of natural antimicrobial substances by various cells, including immune T-cells and cells lining the respiratory tract. The research is still young, but these findings suggest that low levels of vitamin D may be one reason why we are generally more susceptible to infection in winter, when there is less sunshine – although other

factors that affect viral survival, such as temperature, humidity and the gloopiness of the protective mucus in our noses, could also be in play.

So how much vitamin D should we really be getting? There is currently no agreement on the optimal level. UK and US government guidelines focus on getting enough vitamin D to build healthy bones and teeth, and suggest the aim should be around 20 nanograms per millilitre of blood. But for a strong immune system we may need more. The Endocrine Society, a medical organisation dedicated to the study of hormones, says it could be anywhere between 30 and 100 ng/ml.

Even assuming 20 ng/ml is enough, if you live at latitudes above around 35 degrees – north of San Francisco, Seville and Seoul or south of Melbourne, roughly speaking – the chances are that you're deficient in vitamin D for at least some of the year. Between November and March (or June to August in the southern hemisphere), the angle of the sun means that few UVB rays hit the Earth at high latitudes, making it very difficult to synthesise vitamin D in skin. Neither can you stockpile enough vitamin D to tide you over the winter months, as bodily stores typically dwindle after around 30 days.

One study of white Britons found that in winter and spring, around half have vitamin D levels below the recommended UK figure, and 15 per cent are deficient year-round. The risk is even greater for people with darker skin living at high latitudes, who need more UVB exposure to make the same amount of vitamin D. Few people have levels low enough to cause the adult equivalent of rickets. But given how even a small deficiency increases the risk of bone fractures, and growing evidence for the role in our immune system, should we be doing more to get more?

Fear of skin cancer means many people are understandably keen to cover up during the summer months, and even moisturisers and make-up now often contain sun protection. That's despite growing evidence that more sun exposure could reduce the risk of getting other cancers – a positive effect also attributed to vitamin D (see "Don't be modest").

The good news is that, unless you are housebound, it should be easy enough to get enough vitamin D on a sunny day without getting a dangerous dose of sun. A fair-skinned person in the UK need only expose their face and arms to the midday summer sun for 10 minutes to generate more than twice the amount they need for the whole day, while a dark-skinned person would need closer to 40 minutes (see map). Apps and gadgets have also appeared recently that calculate how long you should stay in the sun at any given time and location to get enough vitamin D while not getting burned.

But the sun doesn't shine every day, and we can't all go outside when we want. What if it's cloudy or you're stuck in an office? Dense cloud and shade roughly halve the amount of vitamin D you synthesise, while glass blocks it almost entirely. UVB rays also dwindle in the early morning and evening, even though UVA rays continue to penetrate. Sunbeds provide lots of UVA exposure, but very little UVB.

Supplement your sun

So can you eat your way to vitamin D health? Current UK and US guidelines suggest adults need the equivalent of between 15 and 25 micrograms of vitamin D per day from all sources combined, including the sun and diet. A 100-gram packet of smoked salmon would get you there, as would three 160-gram tins of tuna. But if you don't eat a lot of oily fish, it's unlikely you'd meet these requirements through diet alone (see "How to get your daily dose"). In the US, where milk is supplemented with vitamin D, the average intake from diet is around a third of the recommended dose. In the UK, where this is not common practice, the figure is lower.

That leaves vitamin D supplements as a possibility. The UK National Health Service already recommends supplements for children, and suggests that certain groups of adults should take around 10 micrograms of vitamin D per day. These include pregnant and breastfeeding women, those aged

65 and over, and people who "aren't exposed to much sun". It also points out that dark-skinned people are at greater risk of vitamin D deficiency, though it stops short of recommending supplements.

Taking supplements is not risk-free. You can't overdose on vitamin D from sunshine, as any excess made by the skin is degraded. But ingesting too much vitamin D can cause high blood calcium levels, which can damage the kidneys – although it's unclear at what dosage this becomes a genuine concern.

Some think there is a case for much more widespread use of supplements, at higher doses. Current UK advice is to take no more than 25 micrograms of vitamin D per day in supplement form, while the US Institute of Medicine suggests an upper limit of 100 micrograms. "That's what I take," says Pakpoor.

Such higher limits could become the norm, both to help healthy people get enough, and also to help treat a growing number of ills. Clinical trials are under way in which vitamin D supplements are being given both to people with cancer and multiple sclerosis to see if they have an effect. Early results suggest it might ease the symptoms of MS.

A stroll in the sun is always a joy for body and soul. But as we learn more about the sunshine vitamin and how it works, it seems that our cells are glad of its benefits, too. So get out there and enjoy – like all things, in moderation, of course.

Don't be modest

How much sun is too much? While sunbathing until your skin burns is clearly going too far, evidence is emerging that covering up too much could be counterproductive. People living in sunnier low latitudes are less likely to develop certain cancers, including breast, prostate and colorectal cancer, than those in more northern climes.

Why is that? The presence of receptors for vitamin D on a range of tumour cells suggest they respond to it, and vitamin D is known to influence the expression of genes that regulate cell growth. Studies on animals also show that vitamin D can slow tumour growth, and even encourages certain types of malignant cell to commit suicide. Once again, it seems the sunshine vitamin is at work.

How to get your daily dose

Each of the following will provide you with 15 micrograms of vitamin D – the daily dose recommended by the US Institute of Medicine.

- 0.5 tablespoon of cod liver oil
- 88 g smoked salmon
- 10 tablespoons of margarine
- 15 eggs
- 15 bowls of fortified cereal
- 2.8 kg swiss cheese