Vitamin D, calcium homeostasis hormone

I work as an inflammatory bowel disease nurse, looking after patients with Crohn's disease and ulcerative colitis. Both of these are long-term conditions caused by the body's immune system working over-time and attacking itself. IBD differs from IBS (irritable bowel syndrome) in that there is microscopic and often overt evidence of inflammation in the patient's gut, whereas IBS is thought to be psychological (which can make the condition doubly debilitating for suffers). Bowel inflammation (and sometimes having a shorter bowel as a result of surgery) makes it difficult for people with Crohn's or colitis to absorb nutrients.

Many of our patients need supplements and vitamin D is very trendy in the world of IBD at the moment, so I thought that writing this would help me make sense of the area!

Vitamin D isn't a vitamin – remember Caisimir Funk who in 1911 coined the term vitamin from 'vital amine', i.e. essential organic compound in the diet containing a nitrogen atom? Depending on the season, about 10% of our daily requirement is met from food. In summer (technically, May-September), the body's total requirements could be synthesised in the skin in response to UV B radiation. Nowadays though, it's added to foods such as milk because telling people to sunbathe isn't good public health policy! Consequently, the RDAs in food labelling assume that no vitamin D requirements are met from sunlight. Disingenuous on the part of the food industry? Perhaps not given recent UK summers.

So vitamin D is actually a fat-soluble hormone that helps your body to absorb calcium, phosphate, magnesium and zinc. Vitamins **D2 (ergocalciferol)** and **D3 (cholecalciferol)** are found in fatty foods such as oily fish (tuna, mackerel, salmon), cheese, butter/margarine and egg yolk, and D3 is also synthesised in the skin. It is D3 that is broken down into the hormone calcitriol, which regulates the amount of calcium and phosphate in the bloodstream, therefore promoting the healthy growth and remodelling of bone. Did you know your entire skeleton renews itself every two years? You do now!

It would be remiss of me not to look into the difference between oily fish and non-oily fish. The latter are generally bottom feeders, or demersal fish (from the Latin *demerge*, to sink). To do this, they need to be heavier than water and we all know that oil floats on water. So this group – generally **white fish** – contain just 1–4% oil. **Oily fish** by contrast contain up to 30% oil. One type are forage fish (sardine, herring, anchovy). Another type are pelagic fish (salmon, trout, tuna, mackerel), these fish live in water columns away from the seabed and their higher oil content helps them to float. Current recommendations are 2–4 portions of fish per week, one of which should be oily. This balances the benefits of oily fish against the risks of increased mercury and dioxin consumption. Another fine line for us to tread!

Returning to intake from sunlight, the NHS website states that "the hands and face only need to be exposed to the sunlight for about 15 minutes a few times a week during spring and summer to provide you with enough vitamin D" – easily met by most runners! Interestingly, winter sun in the UK isn't strong enough to prompt vitamin formation, but because D is a fat-soluble vitamin, the body is able to store sufficient.

When early humans migrated north out of Africa 10000 years ago, there would have been a need to adapt to lower levels of sunlight. To do this, we lost our dark skin pigmentation (melanin), allowing the deeper layers of our skin to synthesise enough vitamin D to see us through the lengthening winters.

Deficiency in the vitamin leads to rickets, the main symptom of which is bone pain. The victim develops bone deformities including curvature of the spine or bow-legs. Because the bones don’t harden properly, the weight of the body pushes the leg bones outwards in the characteristic bow shape. Growth is delayed and there may also be dental problems such as weak enamel and delayed tooth formation.

In 2012 a 5-month old boy died from rickets in London. His parents were this year sentenced to 2 and 3 years for manslaughter because they didn't seek medical help for religious reasons (they were Seventh Day Adventists). The child was breast-fed and the mother was black and vegan, all of

which are increased risk factors for deficiency. The hospital failed to diagnose rickets and only tested vitamin D levels after the baby had died. Fewer than 900 cases a year are diagnosed in English hospitals, but the condition has been on the increase in the last few years.

Those most at risk of deficiency fall into four groups: pregnant and breast-feeding mums, under 5s (if not drinking >500ml milk daily), housebound over 65s and patients taking steroids or anti-epilepsy drugs. Supplements should be prescribed by a doctor, because excess vitamin D can result in kidney stones (due to the increase in blood calcium).

Don't abandon your winter training! You may not be getting much vitamin D but the adage "use it or lose it" applies to bone strength; again, runners and orienteers are already doing the right thing to avoid osteoporosis simply by being active. On the whole, runners (the outdoor variety) shouldn't worry about vitamin D deficiency in themselves but the symptoms and food sources are worth knowing about.

Sources

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