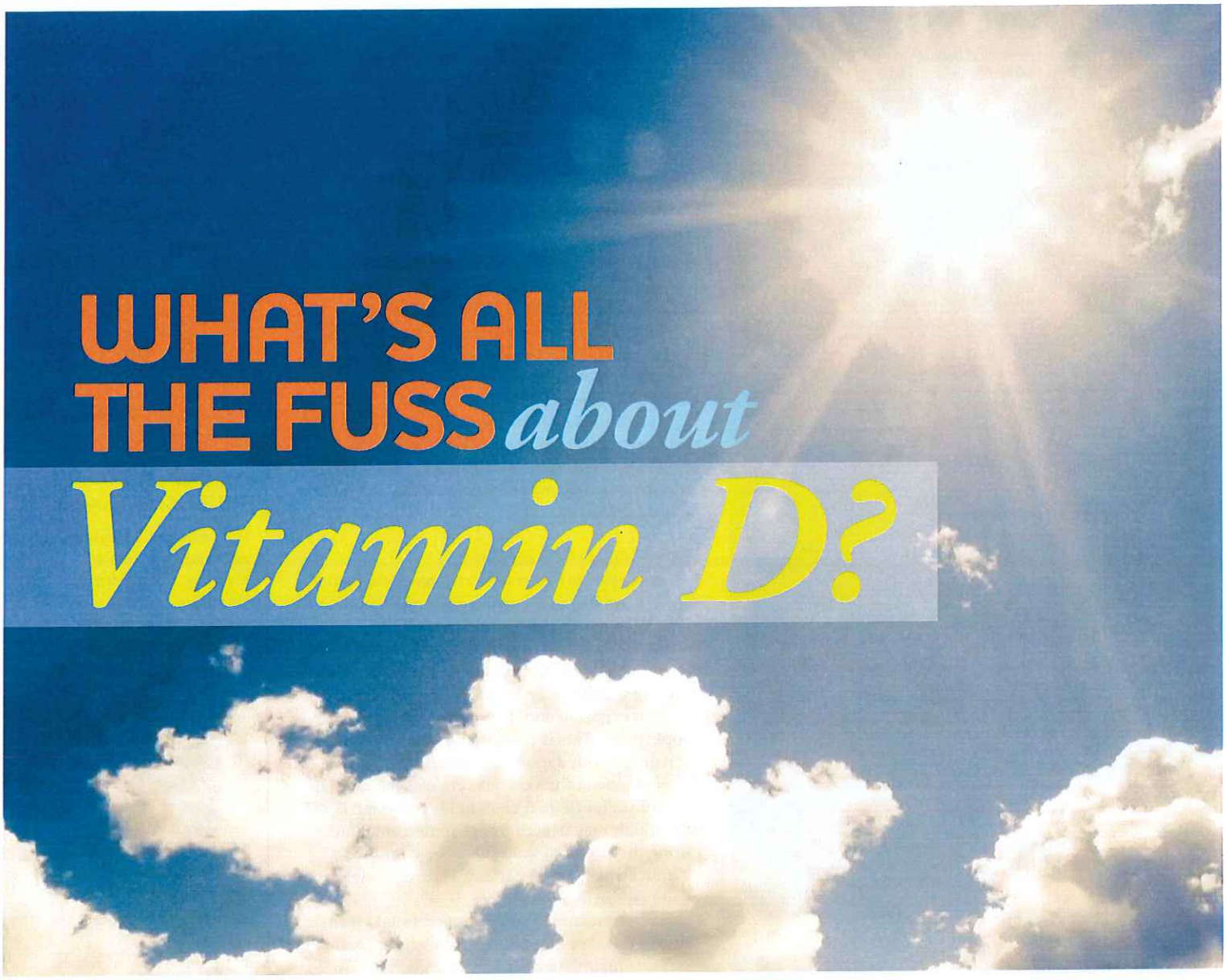

WHAT'S ALL THE FUSS *about* *Vitamin D?*

A question asked and researched by the Sport and Exercise Nutrition Team, Liverpool John Moore's University

Unlike other vitamins, vitamin D is primarily synthesised in the skin via exposure to sunlight (ultraviolet B radiation) with little contribution to intake coming from the diet.[10] This system for manufacturing vitamin D was a smart evolutionary adaptation for our ancestors in the sun-bathed climates of Africa, however it poses a challenge to modern day humans.

People now populate climates vastly different from Africa, with those residing at northern latitudes (such as in the UK), experiencing significant cloud cover throughout the year. Coupled with the modern indoor lifestyle (both work, training, and homes often sheltered from the sun), this has resulted in an estimated 1 billion people worldwide suffering from vitamin D insufficiency. In addition, we now know that our athletes are no less susceptible to being vitamin D insufficient given we[2, 7, 11] and others[5, 8] have repeatedly shown that professional athletes have highly prevalent rates of vitamin D inadequacy. But what's the fuss about?

THE PHYSIOLOGICAL CONSEQUENCES OF SUN-SHYNESS

Over the past decade, there has been lots of evidence for numerous biological actions for vitamin D. However, it can be difficult to dissect where real physiological effects lie due to large variances in experimental paradigms. However there are some actions of vitamin D that we can be certain about. For example, maintaining sufficient vitamin D concentrations is crucial for normal calcium and phosphate homeostasis and therefore is essential for bone health.[3] This has clear implications for athletes from an injury prevention and recovery perspective with research suggesting that maintaining adequate vitamin D intake can optimise the recovery from anterior cruciate knee ligament surgery.[4]

We also know that low vitamin D concentrations can compromise immune function and increase susceptibility to infection, which has also been demonstrated in athletic populations[9] and again has implications in training and performance.[9] Our research team has also recently published data in

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recreationally active humans and cultured muscle cells from humans suggesting an important role of vitamin D in skeletal muscle regeneration. Specifically, we see that by improving vitamin D concentrations from insufficient to sufficient, muscle regenerative capacity is increased.[12] These insights are also supported by work from other researchers from the Institute of Sports Medicine in Copenhagen, who demonstrate that muscle adaptation during training is facilitated by maintaining sufficient vitamin D concentrations.[1]

Ensuring adequate vitamin D concentrations throughout the year is crucial for bone health, immune and muscle function, all of which are of particular importance to athletic performers. But what is adequate and how do we achieve this?

SUPPLEMENTATION

Data from our research group over the past five years has shown how we can normalise vitamin D concentrations from levels of insufficiency. In keeping with current European Food Safety Authority (**efsa.europe.eu**) guidelines, our work suggests that daily supplementation with oral vitamin D_3 (not D_2) at a dosage of 4,000 IU can effectively raise vitamin D concentrations in the body to a sufficient level (considered at 75 nmol.L^{-1}) that improves the recovery of skeletal muscle. It is important to note that super doses given weekly, monthly or yearly may be detrimental and should be advised against.

WHAT TO DO IN PRACTICE

It is important to first screen athletes to find out if they are sun bed users, already taking vitamin D supplements or multi-vitamins with high concentrations of vitamin D. The likelihood is that these athletes do not need supplementation. Those at risk of insufficiency are individuals that don't seek sun exposure and do not take any of the above supplements. This is particularly true for individuals with darker skin, since the pigmentation of the skin outcompetes the natural mechanism for dermal vitamin D synthesis.[6] These individuals may benefit from supplementation during the winter months (October-April) with vitamin D_3 at 4,000 IU per day. Where possible, we would advise the following:

1. Measure vitamin D concentration (total serum 25[OH]D) from a blood sample. Ideally, a vitamin D External Quality Assurance Scheme (DEQAS) certified laboratory should do this analysis (**deqas.org**) using Tandem Mass Spectrometry.
2. If concentrations are below 75 nmol.L^{-1}, supplement with daily oral dose of 4,000 IU vitamin D_3 (do not use vitamin D_2 as this is not effective for raising 25[OH]D concentration).
3. Monitor 25[OH]D concentration at least once following the initial assessment during the winter months to ensure adherence to the supplement and also to avoid over-use (many athletes will believe more is better) as vitamin D toxicity can occur with excessive supplemental vitamin D.
4. Gradually reduce supplementation into the spring by reducing intake to once every other day, then once per week before withdrawing supplementation in the summer months. If the athletes will be indoors for many months of the summer (for example professional ballet dancers[13], or wear substantial clothing blocking vitamin D synthesis (for example jockeys) then consider screening throughout the year to inform your supplement plan. ●

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FOOTNOTES

For vitamin D, 1 IU = 0025 micrograms
Total 25[OH]D is the sum of circulating 25-hydroxyvitamin D_2 and D_3