Vitamin D and Athletes, Part I: A Growing Interest

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Part I of this Pearls of Practice series highlights the growing interest in the status and needs of athletes in relation to vitamin D. Part II of the series will outline the relationship between vitamin D and injury prevention and identifies take-home practice points for clinicians.

Scientific inquiry involving vitamin D has sparked both public interest and controversy surrounding how much vitamin D is needed to promote good health. Vitamin D appears not only to maintain bone health but also to impact extraskeletal health by mediating inflammatory and immune pathways and contributing to optimal muscle function. Given these findings, it is no surprise that athletes’ interest in vitamin D supplementation has increased. It is conceivable that reversing compromised vitamin D status may affect muscle function, creating significant implications for individuals in the highly competitive world of athletics. Conversely, athletes with chronic vitamin D deficiency or insufficiency may experience impaired strength-gaining potential and increased risk of both hard and soft tissue injury. What are the key aspects of the vitamin D literature that clinicians should understand to help guide responsible supplementation decisions?

VITAMIN D STATUS

The best indicator for measuring vitamin D status is serum 25(OH)D; however, definitive thresholds for using this measure to define vitamin D health are not universally accepted. Although vitamin D deficiency requiring clinical intervention to prevent bone loss is generally defined as serum levels <20 ng/mL, there is no definitive consensus for defining a specific cut-off for vitamin D insufficiency.1,2 Furthermore, the evidence for what constitutes normal 25(OH)D levels to promote or support extraskeletal health are murkier. Some have described vitamin D insufficiency as levels between 20 and 31 ng/mL, which is consistent with a common recommendation to maintain a level of 32 ng/mL to promote maximal calcium absorption.3 Despite this cut-off guideline, many have hypothesized that the optimal range for promoting muscle health and performance may fall between 40 and 70 ng/mL.2 Although this range is actively being recommended by some, others argue that these values are primarily based on correlative data and not yet supported by randomized controlled trials. In addition, the long-term safety of maintaining values within this range exclusively with dietary supplementation has not been thoroughly supported. As we await findings from future studies, rates of documented vitamin D insufficiency and deficiency increase. Athletic populations are prone to marginal vitamin D status and are at greatest risk when training primarily occurs indoors.1-5

VITAMIN D NEEDS

Sun exposure is a major source of vitamin D, with solar ultraviolet B (UVB) rays meeting up to 100% of requirements.2 However, with many barriers to natural vitamin D synthesis, including sunscreen use, an indoor working environment, and limiting sun exposure to reduce skin cancer risk, many people rely on vitamin D derived from natural dietary sources, fortified foods, or dietary supplementation.2 In 2010,
the Institute of Medicine (IOM) revised the recommended dietary allowance (RDA) for vitamin D from 400 to 600 IUs per day for adults between 18 and 65 years of age.\textsuperscript{2,3,5} This recommendation was based on maintaining adequate bone health with minimal or no sun exposure. The new RDA has sparked controversy as being too conservative, and there is little evidence that 600 IUs will reverse the high prevalence of vitamin D insufficiency or support optimal athletic performance.\textsuperscript{2} As we continue to discern the extraskeletal benefits derived from higher 25(OH)D levels, a disconnect continues to exist between the small increase in the RDA and the recommendation to achieve higher 25(OH)D levels to maintain extraskeletal health.

Athlete consumption of vitamin D from natural food sources (eg, eggs, fatty fish) has been documented to be well below the current RDA, and there is no supportive evidence to suggest that interventions to increase natural consumption are practical or effective at significantly increasing 25(OH)D in this population.\textsuperscript{2,4,5} Some amount of vitamin D supplementation is likely needed, and prudent recommendations should be individualized based on a 25(OH)D assessment and changes in UVB exposure. Vitamin D supplementation, ranging from 1,000 to 4,000 IUs (or more if clinically deficient), may be necessary, depending on the type of athlete and individual response to supplementation. Recently, daily supplementation of 4000 IUs of vitamin D3 for 6 months was effective at maintaining 25(OH)D levels above 40 ng/mL throughout the competitive season in collegiate swimmers and divers without toxicity.\textsuperscript{5} Supplement strategies should also be adjusted with the emergence of evidence-based findings related to outcomes important for athletes (eg, injury prevention, performance).

\textbf{REFERENCES}