The Importance of Vitamin D to Running Performance

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There is growing evidence vitamin D is a critical component of many physiological processes important to running performance and deficiency can contribute to many problems that lead to sub-optimal outcomes.

In this article, we will consider sources of vitamin D to the body, physiological functions reliant on vitamin D, problems associated with deficiency and the assessment and monitoring of vitamin D levels.

Vitamin D is a fat-soluble vitamin, predominantly produced in the skin under exposure to ultraviolet-B (UVB) radiation provided from the sun. Vitamin D is also found in some foods such as fatty fish but is not present in most natural human diets (2). Because sunlight is the major source of vitamin D, many people can become deficient in this vitamin due to inadequate UVB exposure. UVB radiation is effectively absent in the early mornings and late afternoons and for entire months in countries above 35° latitude. Clothing and sunscreen also effect vitamin D production by the skin by blocking UVB radiation. Dark-skinned athletes have high levels of melanin, which acts as a natural sunscreen, and they require 10 times the UVB exposure to produce the same amount of vitamin D as fair-skinned individuals (2, 4). For runners, this can be an issue in the winter months if all the training is completed in the early morning and late afternoon with the middle of the day spent indoors at work. Also, runners who constantly avoid the sun, use sunscreen or are dark-skinned can be at greater risk of vitamin D deficiency. Vitamin D can be taken as a supplement if individuals cannot produce adequate levels from sunlight and diet. Ultraviolet lamps can also provide a means for producing vitamin D and have been used in countries where sunlight is an insufficient source of UVB during winter months.

Physiological functions:
Vitamin D plays an important role in the body including allowing body cells to utilise and maintain constant levels of calcium and phosphate, which is essential for cell metabolism and bone mineralisation (3). Vitamin D has been shown to have an important role in calcium metabolism and protein production in human skeletal muscle making it pivotal to optimal muscle function (4). Vitamin D also plays an important role in immune function, with clear evidence that vitamin D deficiency impairs T-cell mediated immunity, however vitamin D in excess can also suppress certain autoimmune disorders such as multiple sclerosis, diabetes mellitus,

inflammatory bowel disease and rheumatoid arthritis. It is likely that the suppression of these autoimmune diseases involves the vitamin D hormone interacting with T helper lymphocytes, which in turn, suppress the inflammatory responses (3). There is evidence to suggest athletic performance is improved with increased exposure to UVB light, whether artificially from UV lamps or naturally from the sun, that are linked to levels of vitamin D in the body (2).

Deficiency:

Because of its role in the immune system, deficiency in vitamin D has been linked by cross-sectional data to bowel and colon cancers, diabetes, arthritis and cardiovascular disease (3, 4). A meta-analysis of 18 randomised controlled trials found that supplemental vitamin D significantly reduced total mortality, that is, it prolongs life (1). The importance of vitamin D to bone mineralisation means that deficiency can lead to increased occurrence of osteoporotic and stress related fractures (4). Because of the high loads placed on the body during running, maintaining adequate vitamin D levels seems crucial to help avoid bone injuries. It is also possible that deficiency in vitamin D will increase the risk of tissue injury, such as muscluoskeletal injuries, and reduce muscle function, which will impact greatly on running performance. Muscle biopsy studies in vitamin D-deficient patients have shown supplementation of vitamin D significantly increased the content and size of type II muscle fibres and increased muscle strength, while it has also been shown to increase bone area and mass, and reduce the number of falls in the elderly (2, 4).

Assessment and supplementation:

To protect against bone diseases, maximise muscle function and help prevent other kinds of degenerative diseases and autoimmune diseases, adequate concentrations of vitamin D are extremely important. It is the view of many scientists that recommended dietary allowances of vitamin D are too low (3). Evidence is growing for the role of adequate vitamin D levels to optimise skeletal muscle function, performance capabilities and injury management of young, otherwise healthy athletes (4). While further research is required to evaluate the level of vitamin D required for optimal muscular function, athletes should be aware of the broad impact of vitamin D deficiency and have levels routinely checked by a blood test, along with other factors such as iron levels. Recent evidence suggests ideal levels of vitamin D are greater than 50 ng/ml for optimal performance and at least above 40 ng/ml, as below this level, the body diverts most or all of the ingested or sun-derived vitamin D to immediate metabolic needs, signifying chronic substrate starvation (2).

Other sources of Vitamin D

Conclusion:

Vitamin D plays an important role in many physiological functions and is critical for optimal bone health and musculoskeletal function. Adequate vitamin D levels also appear to be important in reducing the prevalence of many diseases such as diabetes, certain cancers and arthritis. Vitamin D is predominantly produced by the skin when exposed to UVB radiation from the sun mainly in the summer months of the year. Vitamin D deficiency can have a large impact on running performance and injury status. It's worth monitoring closely, especially in the winter time, if you do not spend much time outdoors, or always wear sun protection. If a runner is deficient in vitamin D, it is worth supplementing to maintain adequate levels and maximise physiological capacities important to running performance.

References:

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