



AIS SPORTS SUPPLEMENT FRAMEWORK

VITAMIN D SUPPLEMENT

What is it?

- > Vitamin D is classified as a fat soluble vitamin which acts functionally as a hormone and has a structure that is similar to steroid hormones.
- > There are two different isoforms of Vitamin D: D3 (cholecalciferol), which is the important isomer formed in human skin and D2 (ergocalciferol), which is the plant-derived equivalent. D2 was the first isoform to be characterised and was first used in Vitamin D supplements and for food fortification. D3 is now considered preferable. D3 is biologically inert until converted in the liver to 25(OH)D and to 1,25(OH)D in the kidney.¹
- > Vitamin D plays an important role in calcium and phosphate homeostasis (bone health), gene expression and cell growth. The recent recognition of Vitamin D receptors in most body tissues indicates a role for Vitamin D in many aspects of health and normal function. Vitamin D is now known to be important for optimal muscle function.
- > The principal source of circulating Vitamin D comes from exposure to ultraviolet B (UVB) radiation from sunlight.
- > In 2010, the Institute of Medicine issued new Dietary Reference Intakes for Vitamin D, assuming no sunlight exposure; this included a Recommended Dietary Intake of 600 IU/d and an upper-Level intake of 4000 IU/d (www.ncbi.nlm.nih.gov/books/NBK56070/pdf/Bookshelf_NBK56070.pdf). The Australian Government Department of Health and the New Zealand Ministry of Health developed a *Methodological Framework* in 2015 to guide future reviews of priority Nutrient Reference Values (NRVs). Assuming no sunlight exposure, the adequate intake for Vitamin D in Australia is estimated to be 5 – 15 mcg/day (200 – 600 IU/day), depending on age and sex (www.nrv.gov.au/nutrients/vitamin-d)
- > Vitamin D deficiency can lead to several health issues including increased risk of bone injuries, chronic musculoskeletal pain and viral respiratory tract infections.
- > There is also emerging evidence that supplementing Vitamin D in athletes with sub-optimal Vitamin D levels may have beneficial effects on athletic performance, especially in relation to strength, power, reaction time and balance.²⁻⁵
- > There is no universally accepted definition of Vitamin D deficiency however, the following definitions based on serum levels of 25(OH) Vitamin D are often cited and have the most clinical utility:
 - Vitamin D deficiency: serum levels < 20 ng/ml (50 nmol/L)
 - Vitamin D insufficiency: serum levels < 30 ng/ml (75 nmol/L)
 - Vitamin D sufficiency: serum levels > 30 ng/ml (75 nmol/L)
 - Ideal Vitamin D range*: 75-120 nmol/L
 - Toxicity: > 375 nmol/L when combined with raised serum calcium

*Higher status may be preferred for athletes to allow a greater safety margin and to optimize performance; some agencies working with elite athletes often set their own thresholds for desired Vitamin D concentrations
- > Several recent studies have shown low levels of vitamin D among athletes.⁶⁻⁸

What does it look like?

- > Vitamin D supplements are available for oral intake and intramuscular therapy. Vitamin D3 is the preferable supplement form and is well tolerated.
- > Conversions for Vitamin D3
 - Sources: 40 IU = 1 µg
 - [serum]: 2.5 nmol/L = 1 ng/mL
- > The principal source of Vitamin D comes from exposure to ultraviolet B (UVB) radiation from sunlight (see Table).



Regional recommendations for sun exposure times for individuals with moderately fair skin. Times for people with highly pigmented skin would be 3–6 times longer.

| Region | Summer 10am or 2pm | Winter 10am or 2pm | Winter 12 noon |
|-----------------------------------|-----------------------|-----------------------|-------------------|
| Northern Australia [e.g. Cairns] | 6–7 min | 9–12 min | 7 min |
| Central Australia [e.g. Brisbane] | 6–7 min | 15–19 min | 11 min |
| Southern Australia | | | |
| Sydney | 6–8 min | 26–28 min | 16 min |
| Melbourne | 6–8 min | 32–52 min | 25 min |
| Hobart | 7–9 min | 40–47 min | 29 min |

Adapted from⁹

- > Small amounts of vitamin D can be found in foods such as oily fish, egg yolks and fortified foods such as milk, orange juice, cereals and margarine. However, even Vitamin-D rich food sources generally provide ~ 40–150 IU per serve and will not meet Vitamin D requirements.

How and when do I use it?

- > Athletes who are tested and found to have low levels of Vitamin D should be informed about the important role that Vitamin D plays in health and sporting performance and that supplementation is safe and beneficial.
- > Depending on time of year, athletes identified with inadequate Vitamin D status will require 2000 IU/day for 1-2 months to restore status. Thereafter, Vitamin D status should again be verified via a blood test
- > Athletes at risk of Vitamin D deficiency include those who:
 - Have low exposure to sun in training environment (e.g. training indoors or in early morning and late afternoon)
 - Have dark skin pigmentation
 - Live at latitudes > 35 degrees north or south of the equator [Brisbane = 27 degrees, Perth = 32 degrees, Sydney = 34 degrees, Adelaide and Canberra = 35 degrees, Melbourne = 38 degrees, Hobart = 42 degrees]
 - Wear clothing that covers most or all of their body
 - Regularly use sunscreen or consciously avoid the sun
 - Are missing limbs (e.g. many athletes with disability)
 - Have gastrointestinal malabsorption (e.g. Coeliac disease or fat malabsorption syndromes)
 - Have a family history of bone injury/disorders or Vitamin D deficiency

Are there any concerns or considerations?

Toxicity

- > Over-exposure to UVB (natural sunlight or tanning beds) in an effort to increase vitamin D levels is not recommended as it can lead to sunburn and skin cancer, including melanoma.
- > There is some concern, but also dispute, about the level of Vitamin D supplementation that is considered excessive and associated with symptoms of toxicity. More research is required in this area before definitive conclusions can be drawn.

Where can I find more information?

Sports Dietitians Australia

www.sportsdietitians.com.au/factsheets/supplements/vitamin-d

Gatorade Sports Science Institute

www.gssiweb.org/docs/default-source/sse-docs/close_sse_191_v6_final.pdf?sfvrsn=2

Supplement safety information

www.sportintegrity.gov.au/what-we-do/anti-doping/supplements-sport



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Athletes should be aware that the use of supplements may have doping implications. Athletes are reminded that they are responsible for all substances that enter their body under the 'strict liability' rules of the World Anti-Doping Code. Some supplements are riskier than others. The Sport Integrity Australia (SIA) app is a useful resource to help mitigate the risk of inadvertent doping by helping to identify supplements that have been batch-tested. The SIA App provides a list of more than 11,000 batch-tested products. We recommend that all athletes consult the educational resources of SIA regarding the risks associated with supplements and sports foods. While batch-tested products have the lowest risk of a product containing prohibited substances, they cannot offer you a guarantee that they are not contaminated (www.sportintegrity.gov.au/what-we-do/supplements-sport).

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