

Introduction to the themed issue 'Vitamin D update'

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This collection of papers brings an update on several issues surrounding the potential for increased vitamin D status to provide better health. It acknowledges that vitamin D can modulate multiple tissue responses, including cell metabolism, cell growth and differentiation, tissue repair, and immune regulation. It also confronts the current controversies of how much vitamin D humans require, how to increase vitamin D levels most effectively, how to understand both the immune-enhancing and suppressing effects of vitamin D, and how to relate vitamin D status to specific disease states.

Gorman and Hart review the current evidence that vitamin D is immunosuppressive in the mouse, that it may itself contribute to UV radiation (UVR)-induced immunosuppression, and that supplementation with vitamin D or activation of its metabolic pathways can be therapeutic in experimental models of diseases that are characterised by overzealous immune responses. In contrast, it is also observed that vitamin D and related compounds can protect mice against UVR-induced immunosuppression and subsequent photocarcinogenesis. *Dixon et al.* describe one such vitamin D analogue that is photoprotective, reducing both UVR-induced DNA damage in human skin cells and immunosuppression in mice. The action was *via* a rapid-acting non-genomic pathway, indicating that some vitamin D actions are independent

of the vitamin D receptor. However the reported disparities in vitamin D's immune regulation in laboratory mice and humans remain to be clarified. Although an association was demonstrated between the increase in vitamin D status aligned with therapeutic photohardening for resolution of the immunological disease polymorphic light eruption (PLE) in patients (*Gruber-Wäckernagel et al.*), no association was found between the incidence of mid-winter colds and experimental sunbed-elevation of vitamin D status in a group of Northern European subjects (*de Gruijl and Pavel*).

The role of vitamin D in cancer prevention has been reviewed by *Bikle*, summarising its effects on the balance of cell proliferation/differentiation, immune regulation, and DNA damage repair, properties by which vitamin D can suppress photocarcinogenesis. In support, *Gordon-Thomson et al.* report new evidence supporting a vitamin D anti-skin cancer role at the level of UVR-induced DNA damage reduction in both human skin cells and hairless mouse skin. Here no disparity between the mouse and human was identified, and the protective effect against DNA damage was effectively demonstrated.

The search for an indication of the optimal serum vitamin D levels for good health continues. *Liu* reviewed the nutritionally significant levels of vitamin D in natural foods, observing that diet alone

cannot provide adequate vitamin D status in humans, which requires UVR exposure and/or oral supplementation for healthy levels. *Datta et al.* provided evidence that artificial UVB irradiation is 8 times more effective in increasing serum vitamin D than the equivalent solar exposure, an observation supporting sunbed use in countries of high latitude, especially during the 'vitamin D winter'. *Parisi et al.* measured the significant and variable reduction in vitamin D-effective solar UV radiation by high levels of cloud cover, concluding that recommendations for effective solar exposure times were difficult to make under high cloud conditions.

Further to the health effects of vitamin D status has been recent evidence of an effect of this hormone on endogenous drug metabolism. *Lindh et al.* have reviewed new information that vitamin D has a role in upregulating the major hepatic and intestinal drug metabolising enzymes that detoxify both endogenous molecules, environmental toxins and therapeutic drugs. Seasonal changes in therapeutic drug turnover, previously not understood, therefore now appear to be associated with changes in vitamin D status. Future research might explore the potential to tailor pharmacological drug dosages appropriately by season.

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