

SUN HEALTH TECHNOLOGIES

CORRELATION BETWEEN VITAMIN D, UVB, AND MS

Researchers are finding a strong association between vitamin D levels, UVB exposure and multiple sclerosis (MS).

According to the Mayo Clinic, the link between vitamin D and MS can be seen in the correlation between the increasing incidence of MS the farther away from the equator a person lives. [1] Vitamin D is produced when the skin is naturally exposed to the sun's ultraviolet B (UV-B) rays, suggesting that exposure to UV-B may offer protection from MS.

Recent research has uncovered correlational relationships between vitamin D and multiple sclerosis. A study conducted by researchers at the University of Oxford and another conducted at the New Jersey Medical School have suggested that maintaining adequate levels of vitamin D may have a protective effect and lower the risk of developing multiple sclerosis. Another study conducted at Maastricht University in the Netherlands and others suggest that for people who already have MS, vitamin D may lessen the frequency and severity of their symptoms. [3]

The National MS Society has led the way in researching the correlation between vitamin D and multiple sclerosis. The National MS Society funded a study which showed that people who had higher levels of vitamin D were less likely to develop multiple sclerosis. [4] Another study from the Harvard School of Public Health also found that participants with higher levels of vitamin D had a lower risk of developing multiple sclerosis later in life. [5]

According to a 2013 study, maintaining appropriate levels of vitamin D may help prevent and mitigate the risks and symptoms of multiple sclerosis and other autoimmune disease. [6] Restoring vitamin D levels to the healthy range can also help patients with autoimmune diseases according to recent research. [7] Specifically,

vitamin D has been shown to increase the number of regulatory T-cells that restore immune system activity to its normal state, preventing the overactive response characteristic of autoimmune diseases. [8] A large scale clinical trial also showed increases in vitamin D reduced the risk of developing multiple sclerosis by 40%. [9]

Vitamin D Phototherapy versus Oral Supplementation

Unlike other vitamins, which may be increased by simple oral supplementation, Vitamin D is a pre-steroidal hormone that is produced predominantly through skin exposure to UVB. Clinical studies have shown that phototherapy is a far superior mechanism for increasing vitamin D as compared to oral supplementation. Studies comparing oral supplementation, sun exposure, and UVB phototherapy for the treatment of vitamin D deficiency have shown that UVB phototherapy is three times more effective than controlled sun exposure [23] and eight times more effective than supplementation. [24] In fact, new evidence suggests that UVB may provide remarkable health benefits beyond vitamin D production.

UVB Benefits For MS

In addition to UVB's superiority in creating vitamin D, UVB therapy has been shown to have remarkable results in treating MS. Recent evidence with experimental autoimmune encephalomyelitis (EAE), an animal model of MS, established that UVB rather than vitamin D may be the cause of this geographical correlation. In fact, the study showed remarkable results in the suppression of EAE by UVB. The study concluded that the disease suppression was not the effect of vitamin D production but rather that UVB therapy is largely responsible. [60]

Researchers also found that UVB exposure suppressed the clinical symptoms of MS in humans independently of vitamin D synthesis. [61] Regulatory T cells (Tregs), which are induced locally in the skin-draining lymph nodes in response to UVB exposure, connect the cutaneous immune response to CNS immunity by migration to the sites of inflammation. In this study, the inflammatory response and disease

symptoms were minimized with UVB therapy. Specifically, the MS patients treated with UVB phototherapy showed an increase in induced Tregs and tolerogenic DCs accompanied by the downregulation of the T-cell effector cytokine interleukin. Therefore, the UVB therapy had a positive effect on decreasing the symptoms of MS in humans.

UVB's Protective Effect Against Disease

UVB also has been shown to play a role in decreasing disease risk. A review of ecological studies that examine geographical variations in disease outcomes demonstrate a higher incidence of all cause mortality inversely correlated with geographical UVB doses. [42-44] UVB's protective effect against disease has also been reported in both observational studies [45, 46] as well as randomized control trials. [47, 48]

Observational studies have associated vitamin D deficiency with increased prevalence of autoimmune and other diseases. However, randomized controlled trials to treat these disease states with vitamin D supplements have not produced promising results. This has led to a recent line of research that indicates that vitamin D levels may only provide a mechanism of measuring sun exposure. Instead, UVB induced mechanisms rather than vitamin D driven processes may explain many of the benefits often attributed to vitamin D. [49-51]

Clinical evidence has clearly demonstrated the immunoregulatory effects of UVB exposure on the development of allergic asthma in both animal [52] and human models. [53] UVB-induced systemic immunosuppression has been implicated not only to down-regulate immune processes involved in multiple sclerosis, allergic asthma, and type 1 diabetes but also to control inflammatory skin conditions such as psoriasis and atopic dermatitis, as well as reduce responses to vaccines, cancer antigens, and infectious agents [54-56, 60, 61]

In addition to the vitamin D photoreceptors in the skin, there are several photoreceptors that absorb UVB photons, which have been implicated in UVB induced immunoregulation. These include DNA and lipids of skin cells and trans-urocanic acid

located in the stratum corneum. There are several excellent recent reviews of the cellular, biochemical, and immunological changes in the epidermis and dermis upon exposure to UVB and the subsequently increased immune activity in the draining lymph nodes. [57, 58] In addition, UVB has a regulatory effect on T cells. UVB induced T regulatory cells are able to alter antigen presenting cells from stimulatory to regulatory, as well as alter their migration patterns by changed chemokine receptor expression. [59] Thus, UVB has been found to have a protective effect against disease beyond vitamin D expression.

Additional UVB benefits on disease states were explored in a recent study. This study cited many benefits including production of Nitrous Oxide, which is known to reduce blood pressure and improved cardiovascular health. UVB exposure also improves mood through the release of endorphins. The study concluded that UV radiation may affect many more disease states independent of vitamin D production; therefore, additional studies were needed to further this research. [63]

Safety and Efficacy of Phototherapy

In a study examining the effects of phototherapy, there has been no significant increase in the risk of developing squamous cell carcinoma or basal cell carcinoma associated with long-term exposure to UVB over 25 years. [38] Similarly, a 10 year follow up study of patient exposed to phototherapy showed no significantly increase in the risk of skin cancer. [39]

Conversely, a recent large-scale study following nearly 30,000 women over 20 years, found that women who avoid UVB are at increased risk of skin melanomas and are twice as likely to die from any cause, including cancer. [40]

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