

Research Progress of Vitamin D and Autoimmune Diseases

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ABSTRACT

As a fat-soluble vitamin, Vitamin D is a necessary hormone to maintain normal physiological activities of the body. In recent years, vitamin D has been considered as a new neuroendocrine-immunomodulatory hormone, and researchers have paid more attention to the study of immune regulatory mechanism. It is not only related to calcium and phosphorus metabolism, bone metabolism and other important metabolic mechanisms of the body, but also closely related to the immune regulation mechanism of the body. Vitamin D deficiency caused by many factors can play a certain role in the development of autoimmune diseases. In this paper, the related mechanisms of vitamin D affecting autoimmune diseases were reviewed, with a view to expound the close correlation between vitamin D and autoimmune diseases, so as to find new diagnosis and treatment approaches for clinical autoimmune diseases and improve the quality of life of patients with autoimmune diseases.

1. Introduction

Vitamin D (VitD) is a fat-soluble vitamin necessary for human growth and development, which cannot be synthesized by itself, but can be obtained through food or through the skin absorption of ultraviolet isomerism. The main regulatory activity in the human body is 1, 25-dihydroxyvitamin D₃ [1, 25(OH)₂D₃]^[1], not only plays an important role in calcium and phosphorus

metabolism, bone metabolism, cell growth and differentiation, also play an inhibitory effect in a variety of autoimmune diseases^[2]. A large number of studies have shown that vitamin D deficiency is closely related to the occurrence and development of autoimmune diseases, tumors, cardiovascular and cerebrovascular diseases, diabetes and other diseases^[3-8]. At the same time Vit D also play an important role in anti-inflammatory and immune regulation, reduction of vitamin D levels in many autoimmune

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disease patients is widely reported [9-10]. Based on this, a review on the research progress of vitamin D and autoimmune diseases is presented.

2. Immunomodulatory Effects of Vitamin D

Vitamin D plays an indispensable role in the immune system. Because immune cells express vitamin D receptor (Vitamin D Receptor, VDR), vitamin D can be combined with VDR in immune cells to affect the biological activity of vitamin D metabolic pathway to regulate innate and non-adaptive immunity. The main factor of its vitamin D metabolism pathway to regulate the body is its active form [125-(OH)₂-Vit D₃], its effect on immune regulation is bidirectional, through the degree of expression can not only improve the body's own immunity, but also inhibit abnormal strong immune response [11]. Active vitamins D reduce the production of autoimmune systemic diseases by regulating innate and adaptive immunity, autoimmune diseases such as systemic lupus erythematosus and rheumatoid arthritis have been validated in mouse models [12-13]. In innate immunity 1,25-(OH)₂-VitD₃ mediates further monocyte differentiation into macrophages, Causes macrophages to produce immunosuppressive prostaglandin E₂, Inhibition of macrophage secretion of inflammatory factors and chemokines; At the other hand, it can directly regulate the expression of anti-microbial peptide gene and enhance the of anti-infection ability. In adaptive immunity, 25-(OH) 2-VitD₃ can affect the differentiation of activated T cells and inhibit Th1 cell response, may also indirectly inhibit the proliferation of activated B cells by regulating Th cells [14].

3. Vitamin D and Autoimmune Diseases

3.1 Vitamin D and Autoimmune Thyroid Disease

Autoimmune thyroid disease (Autoimmune Thyroid Diseases, AITD) is an organ-specific autoimmune disease. Its main pathological types are Graves disease (Basedow Disease, GD) and Hashimoto's thyroiditis (Hashimoto Thyroiditis, HT).

Clinical studies have shown that autoimmune thyroid disease is associated with vitamin D deficiency in recent years [15-17], KE and other studies of GD patients show that normal people have higher levels of vitamin D than GD patients. Tamer studies show that, The deficiency of vitamin D in HT patients makes its incidence much higher than that of healthy control population [16]. Studies by He Jing et al on patients diagnosed with AITD and vitamin D deficiency show that, Vitamin D supplements can reduce antibody levels in AITD patients, Has been relieved and even sig-

nificantly improved [17]. All these studies have one thing in common: people with low levels of vitamin D, Higher incidence of autoimmune diseases and timely vitamin supplementation D help patients improve autoimmune diseases. The pathogenesis of AITDs is also regulated by genetic factors. Abnormal expression of genes related to vitamin D metabolic pathway leads to uncontrolled autoimmune monitoring and abnormal proliferation of autoantibodies, which leads to the production of autoimmune thyroid diseases [17-18]. This shows that vitamin D plays a certain role in the occurrence and development of AITD.

3.2 Vitamin D and Rheumatoid Arthritis

RA (Rheumatoid Arthritis, RA) is a chronic autoimmune inflammatory disease, characterized by autoantibody production, chronic synovial inflammation, progressive joint destruction and deformity [19-20]. RA is a devastating and common autoimmune disease, A lifetime prevalence rate of 1% worldwide, Female, smoking and family history of the disease are more likely to suffer from [21] disease. Although the main cause of RA is unclear, But there have been reports that, The development of rheumatoid arthritis is caused by genetic and environmental factors, Vitamin D metabolic pathway gene VDR is one of the important genes of RA susceptibility [22-23]. In recent years, Single nucleotide polymorphism (Single Nucleotide Polymorphism,) by VDR gene SNP) the search for RA risk related genes has become a research hotspot and VDR gene polymorphisms may affect the occurrence and development of vitamin D by affecting the function and serum level. Tizaoui K et al. Meta-analysis of 1,703 cases and 2,635 healthy controls in 12 case-controls yielded results in homozygotes, In the dominant and allele comparison model, There was a significant correlation between VDR polymorphism TaqI and RA diseases, suggesting that our vitamin D related gene polymorphisms play a role in the occurrence and development of RA. Vitamin D receptor (Vitamin D Receptor,) simultaneously VDR) it is also closely related to the occurrence and development of RA. And VDR, are widely expressed in immune cells such as dendritic cells, macrophages, activated T lymphocytes and B lymphocytes, The results suggest that the immunomodulatory effect of vitamin D can be by regulating factors acting on immune cells [24]. By combining with VDR, Vitamin D inhibits the increased activity of immune cells involved in adaptive autoimmune responses, by inhibiting inflammatory response to regulate immune homeostasis [25]. And then abnormal levels of vitamin D can disrupt that balance, By inhibiting proliferation of Th1 cells, So that bone loss, eventually leading to osteopenia and osteoporosis [26]. To sum up, Vitamin D down to the molecular level,

Up to the receptor protein has obvious correlation with rheumatoid arthritis.

4. Vitamin D and Systemic Lupus Erythematosus

SLE (Systemic Lupus Erythematosus, SLE) is mediated by autoimmunity, of autoimmune diseases involving multiple organs and systems^[27]. The pathogenesis of the disease involves immune, environmental, hormonal and genetic factors, Lack of specificity, it's usually chronic or occult, at present, the pathogenesis is complex and there is no effective treatment^[28]. SLE is common among women of childbearing age, and the disease has the characteristics of repeated delay, easy recurrence, multi-system involvement, at the same time, the clinical treatment of hormones and immunosuppressants will cause a serious burden on the physical and mental health of patients^[29-30]. Although the pathogenesis of SLE remains unclear, some studies have shown that vitamin D plays an important role the occurrence and development of SLE^[30]. A number of clinical meta-analyses show that, the decrease in vitamin D in SLE patients is widespread, the metabolic rate of vitamin D decomposition in patients was faster than that in healthy people^[31]. Islam MA et al. 34 case-control studies (2265 SLE patients and 1846 healthy controls) showed that regular vitamin supplementation D help SLE the treatment of patients. And compared to healthy people, the serum vitamin D level of SLE patients was obviously low^[32]. Through the above research, we know that there is a certain correlation between vitamin D and SLE disease activity, Provide data support for the prevalence of vitamin D deficiency in SLE, Hint that we can regularly supplement vitamin D as part of the health management plan.

5. Conclusion

To sum up, vitamin D, as an immunomodulatory hormone, plays an important immunomodulatory role in immune diseases. As the relationship between vitamin D and autoimmune diseases is deeply studied, it is a research direction to understand the pathogenesis of autoimmune diseases from the gene level, and it can provide a new way for the treatment and prevention of autoimmune diseases. For a better understanding of the role of vitamin D in autoimmune diseases, we need high-quality evidence-based medical evidence and broader prospective studies to provide a new diagnosis and treatment for autoimmune diseases.

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