GALAXY INTERNATIONAL INTERDISCIPLINARY RESEARCH JOURNAL (GIIRJ)
ISSN (E): 2347-6915
Vol. 12, Issue 4, April (2024)

CLINICAL PHARMACOLOGICAL APPROACH TO THE RATIONAL USE OF VITAMINS IN CHILDREN

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ABSTRACT

Modern data on the participation of vitamin D in the formation of various forms of allergic pathology in children are presented. The range of knowledge about the biological significance of vitamin D has recently expanded significantly. The features of vitamin D metabolism and its participation in the leading links in the pathogenesis of atopic dermatitis (AD) are described: in the regulation of the immune response, violations of the integrity of the epidermal barrier and the implementation of allergic inflammation in the skin. The pathogenetic significance of vitamin D deficiency in the formation of bronchial asthma (BA) is discussed.

Keywords: review, vitamin d, allergic diseases, vitamin d deficiency, atopic dermatitis in children, bronchial asthma.

INTRODUCTION

According to forecasts, in 20–30 years, about 50% of the population of our planet will suffer from allergic diseases [1–3]. Of particular concern is the fact that a significant proportion of these patients are children and adolescents. The reasons for the increase in allergic diseases are considered to be genetic and immune disorders, environmental environmental factors, changes in nutrition and intestinal microbiota, as well as a modern urban lifestyle [2]. At the same time, a close connection has been found between vitamin D deficiency and the development of allergic diseases [3]. It should be noted that in the last 5 years, the number of works devoted to the effect of vitamin D on the formation of allergic pathology has increased many times, which indicates the high relevance of this problem [4].

MATERIALS AND METHODS

Despite the fact that the main functions of vitamin D have been known for a long time (participation in phosphorus-calcium metabolism and the prevention of rickets in children), the range of knowledge about it has recently expanded significantly [4]. Historically, vitamin D refers to two related fat-soluble compounds, ergocalciferol and cholecalciferol. Therefore, the generalized name for vitamin D is calciferols [5]. They are fat-soluble compounds and accumulate in the body, so if you overdose on vitamin D, serious complications can occur. Ergocalciferol (vitamin D2) can only be obtained from foods of plant origin. Cholecalciferol (vitamin D3) is synthesized by the epidermis under the influence of ultraviolet rays (UVB) in the range of 280–315 nm and enters the human body with food [4].

RESULTS AND DISCUSSION

Unlike other compounds, vitamin D is essentially not a vitamin in the accepted understanding of the term, since it enters the body in an inactive form and is converted into an active hormonal form only through two-stage metabolism [5]. To activate it, cholecalciferol is first hydroxylated at the 25-carbon atom in the liver with the participation of the enzyme 25-hydroxylase (CYP27A1) to form 25-hydroxycholecalciferol (25(Ho)D) or calcidiol, and then in the kidneys the latter is hydroxylated to 1. 25-dihydroxy-cholecalciferol (1,25(OH)2D3) or calcitriol. This hydroxylation process, which occurs in the kidneys under the action of mitochondrial 1α-hydroxylase (CYP27B1), is the rate-limiting reaction that determines the level of endogenous production of calcitriol, as the active form of vitamin D3 [2]. An increase in the concentration of calcitriol, according to the feedback principle, inhibits the synthesis of 1α-hydroxylase in the kidneys, inhibiting its formation. Calcitriol is then transported into the blood by a complex with a carrier protein, binds to intracellular receptors, interacts with nuclear chromatin and changes the rate of translation of various proteins. In target cells, this promotes the synthesis of proteins that ensure the absorption of calcium and phosphates into enterocytes [3].

The cellular effects of calcitriol (1,25(OH)2D3) are realized through ligand-dependent regulatory molecules called vitamin D receptors (VDR) and belonging to the superfamily of nuclear receptors [2]. The functions of VDR include the ability to modulate biological responses in target tissues by regulating gene transcription, which leads to the binding of vitamin D to the promoter loci of target genes. This slow genomic pathway causes changes in gene transcription over several hours and days. Under these conditions, VDR interacts with other transcription factors, for example, with transcription co-activators and calcium-binding proteins, influences the nuclei of target cells and stimulates the transcription of DNA and RNA, which is accompanied by increased synthesis of specific proteins [3]. Another way of interaction with VDR, the fast non-genomic one, is realized on the cell surface and promotes rapid changes in genes (within seconds or minutes) depending on the reaction [4].

Assessing the adequacy of vitamin provision

D in children and adults in specific conditions is still actively discussed, which is associated with various methods for determining its content in the blood. A reliable laboratory test is currently considered to be the accurate determination of 25-hydroxycholecalciferol concentrations in blood serum using liquid chromatography and mass spectrometry (HPLC-MS) [4]. Its blood level, which ensures optimal skeletal health in most people in the population, is 20 ng/ml (50 nmol/l), and a level <20 ng/ml is defined as deficiency [3]. The need for vitamin D is increased in people who are deficient in UVB: those living in high latitudes, residents of regions with a polluted atmosphere, working night shifts, bedridden patients who do not spend time outdoors, etc. [5]. In the absence of sufficient insolation, to prevent hypovitaminosis D, preference is given to a balanced diet using fortified foods and vitamin-mineral complexes. The activity of vitamin D preparations is expressed in international units (IU): 1 IU contains 0.000025 mg (0.025 mg) of chemically pure vitamin D, i.e. 1 μg contains 40 IU.

Vitamin D and allergic diseases. Vitamin D has the ability not only to form and maintain the health of the skeletal system to prevent the development of rickets in children and osteomalacia in adults, but also plays a role in the development of cardiovascular and

oncological pathologies, infectious and autoimmune diseases [2]. The participation of vitamin D in the formation of various forms of allergic pathology is quite natural, since it directly implements the most important regulatory mechanisms of innate and adaptive immunity [3]. VDRs are found in almost all types of immune cells, which, being nuclear receptors, when activated, have a powerful effect on immune cells, especially macrophages and T-lymphocytes [4]. Activation of VDR leads to suppression of the growth of dendritic cells, a decrease in Th1 cell response and, conversely, an increase in Th2 cell response, which contributes to a shift in the balance towards anti-inflammatory cytokines [5]. Via cytokines, vitamin D prevents inflammation by blocking the interaction of immune cells. Its immunosuppressive activity allows the use of vitamin D preparations and its analogues to control autoimmune diseases associated with hyperproduction of cytokines. It is the anti-inflammatory effects of vitamin D that make it one of the most important factors in the body's immune defense. VDR-dependent is a signaling pathway that ensures the differentiation of T-lymphocytes, which suggests an increase in atopic reactivity under the influence of this vitamin and is considered one of the reasons for the greater incidence of allergies in those generations of children who grew up in the era of mass prevention of rickets.

Against the backdrop of an overestimation of the role of vitamin D as an immunoregulator, it has been convincingly shown that its deficiency contributes to an increase in the incidence of not only chronic infections, but also acute respiratory diseases (ARI), bronchial asthma (BA), chronic obstructive pulmonary disease, etc., although in these forms pathologies of changes in the endogenous production of calcidiol and calcitriol are secondary in nature. Significant correlations have been established between 25(OH)D levels and the frequency of hospitalization for acute respiratory infections in children [4]. Taking this into account, it should be noted that respiratory viruses are detected all year round, and influenza epidemics occur mainly in winter (in northern latitudes), when the content of vitamin D in the blood reaches minimum values. Obviously, the low seasonal level of vitamin D, and not high virulence, should be considered as the reason for the increase in the incidence of acute respiratory infections and influenza in the cold months of the year [5].

CONCLUSION

Thus, the spectrum of vital biological effects of vitamin D is extremely wide, and the prevalence of its deficiency is quite high. That is why compensation for vitamin D deficiency is an important preventive and therapeutic task within the framework of new therapeutic strategies aimed at improving the quality of life of sick children with various forms of allergic pathology.

REFERENCES

1. Genuneit J., Seibold A.M., Apfelbacher C.J., Konstantinou G.N., Koplin J.J., La Grutta S et al. overview of systematic reviews in allergy epidemiology. Allergy. 2017. doi: 10.1111/all.13123.
2. Smirnova G.I. Managing the course of the disease: atopic dermatitis in children. Ross. pediatrician. magazine 2014; 17 (6): 45–53.
3. DaVeiga S.P. Epidemiology of atopic dermatitis: a review. Allergy Asthma Proc. 2012; 33(3):227–34.

4. Williams H.C. Epidemiology of human atopic dermatitis–seven areas of notable progress and seven areas of notable ignorance. Vet. dermatol. 2013; 24 (1): 3–9.
5. Anto J.M., Bousquet J., Akdis M., Auffray C., Keil T., Momas I. et al. Mechanisms of the Development of Allergy (MeDALL): Introducing novel concepts in allergy phenotypes. J. Allergy Clin. immunol. 2017; 139(2):388–99.