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# MEDICAL SCIENCES

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## SEVERAL ASPECTS REGARDING THE DEVELOPMENT AND PROGRESSION OF DENTAL DISEASES WARRANT INVESTIGATION.

***Abstract.***
*The significance or pertinence of a given concept, idea, theory, or phenomenon in a particular field of study. Periodontitis is an inflammatory condition that affects the entirety of the tissues surrounding the tooth and provides support to the tooth in its placement within the jawbone. The aforementioned structures comprise the gums, alveolar sockets, the connective apparatus, the alveolar part situated in the lower jaw, and the alveolar processes of the upper jaw. Inflammation of the tissues results in a gradual decrease in their structural integrity, ultimately leading to a cascade of deleterious effects including hemorrhage, discomfort, dental laxity, and ultimate loss of the tooth. Undertaking a thorough examination of the mechanisms responsible for the formation of abscesses within the periodontium of individuals affected by chronic generalized periodontitis, with the aim of elucidating its etiological factors and achieving a more profound comprehension of the pathogenesis of this ailment, represents a significant mission within contemporary dental science.*

***Keywords.*** *Periodontitis, cytokines, microflora.*

One salient trait of the pathogenesis of purulent processes in the periodontal tissues of individuals diagnosed with generalized periodontitis is a significant deficiency in local secretory immunity, a disparity in the cytokine profile, and a decrease in crucial enzymes within the antioxidant system.

The principal cause behind the deterioration of regional humoral defense can be attributed to immunoglobulins, which are precise antibodies intended to combat bacterial infections. The oral cavity contains four predominant categories of immunoglobulins, namely secretory immunoglobulin A (SIgA), immunoglobulin A (IgA), immunoglobulin G (IgG), and immunoglobulin M (IgM). Two distinct classes of IgA can be identified, namely serum IgA and secretory IgA. The production of secretory immunoglobulin A (SIgA) takes place predominantly within the salivary glands through the mutual interaction of two cellular systems. The resident plasma cells generate IgA, which is akin to serum IgA, while the epithelial cells are responsible for the formation of the secretory IgA complex. The assembly of these entities occurs within the enclosed space of the salivary duct lumens. One notable characteristic of secretory immunoglobulin A (SIgA) is its ability to withstand the effects of a diverse range of proteolytic enzymes. This quality is of significant relevance given that one of its primary biological functions is to impede bacterial adhesion to the surfaces of both teeth and mucous membranes.

A reduction in the concentration of secretory immunoglobulin A (SIgA), a critical component in the antibacterial defense mechanism of the oral mucous membranes, was detected during an investigation of humoral immunity in individuals suffering from generalized periodontitis.

Additionally, various immunoglobulins such as IgA, IgG, and IgM are synthesized locally within the oral cavity. The immunoglobulins infiltrate the oral fluid through the inflamed mucous membrane from the blood serum, leading to a substantial augmentation of their concentration in the vicinity of bacterial antigens. The comprehensive biocidal capacity of the oral mucosal membrane ensues concomitantly with a harmonized response elicited by each class of immunoglobulins.

In contemporary times, the function of cytokines in both the emergence and operation of the immune process has been extensively deliberated within academic discourse. Cytokines serve as agents that facilitate intercellular communication during immune responses, hematopoiesis and inflammation. Furthermore, they are integral to inter-system collaboration. Cellular proliferation, differentiation, and functional activity are impacted by them. Cytokines exert regulatory control over the duration of inflammation and immune response, as well as influencing embryonic and organogenesis processes. Notably, their activity levels may display significant variability across different developmental stages. Cytokines demonstrate reciprocal synergistic or inhibitory effects on one another. Cytokines can be categorized into different groups, such as interleukins (IL), interferons, colony-stimulating factors, and growth factors. According to the mechanism of action, cytokines can be divided into three groups: effectors and regulators of inflammatory processes - pro-inflammatory and anti-inflammatory regulators of antigen-specific immune response; regulators of hematopoiesis of immune competent cells. Each type of immune system cell is capable of producing several cytokines, and each type of cytokine can be secreted by different cells, which means there is interchangeability of cytokine system components.

The protective function of pro-inflammatory cytokines is carried out locally, directly in the focus of inflammation, while the inflammatory process is realized

when there is an imbalance between pro-inflammatory and anti-inflammatory cytokines, which largely determines the severity and outcome.

**Objective:** To investigate the immune status of patients with chronic generalized periodontitis.

**Materials and methods:** To achieve the stated objective, 27 patients aged 40 to 55 years with a diagnosis of generalized periodontitis of severity stages I and II were selected. The control group consisted of 11 practically healthy volunteers with non-affected periodontal tissues at the time of the study.

Saliva was chosen as the substrate for immunological research, which was collected in measuring tubes by spitting. The collected oral fluid was centrifuged at 3000 rpm for 20 minutes. The supernatant fluid was used as a material for studying the levels of concentration of major classes of immunoglobulins (SIgA, IgA, IgG, and IgM) and interleukins (IL-1B, TNF-α, IL-4). The determination of immunoglobulin concentration in saliva was carried out by the solid-phase enzyme immunoassay method. Levels of cytokines (IL-1B, TNF-α, IL-4) in gingival fluid were determined by the solid-phase enzyme immunoassay method. The analysis results were taken into account spectrophotometrically using a microplate photometer Stat Fax 2100 at a wavelength of 450 nm. The determination was made no later than 10-15 minutes after stopping the reaction. The technology for performing solid-phase enzyme immunoassay using sets of reagents for IL-1B, IL-4, and TNF-α was carried out according to the instructions provided by the developers.

**Results of the research and their discussion.**

Research has shown statistically significant deviations in the indicators of local immunity from the values of practically healthy volunteers in patients with generalized periodontitis. These deviations in the levels of major immunoglobulin classes in the examined patients indicate a decrease in the bactericidal activity of oral fluid. Of particular note is a significant decrease in the levels of sIg A, accompanied by a slight increase in the production of Ig A and Ig G, while the concentration of Ig M in saliva remains unchanged, in both the main and control groups of patients, compared to healthy individuals. This indicates a greater insufficiency and strain of compensatory response of local immune defense to antigenic bacterial stimulation, especially in patients with suppuration from periodontal pockets. Individual and averaged data analysis revealed that patients in the main and control groups had significantly higher levels of pro-inflammatory cytokines compared to healthy blood donors. The expression levels of IL-1β and TNF-α in patients with purulent processes exceeded normal values by 4.7 and 3.2 times, respectively, while in patients without suppuration, they were only 2 and 2.2 times higher, respectively. It was found that as the severity of the inflammatory-destructive process in the periodontal structures increased in patients with chronic generalized periodontitis, the concentration of IL-1β and TNF-α in saliva likely increased. Therefore, these indicators can be used as additional criteria for assessing the severity of the disease.

**Conclusion.** The study of cytokines as immunomodulators can contribute to a better understanding of the occurrence of infectious-purulent complications in patients with generalized periodontitis. The results of the study of key regulatory cytokines indicate that the increase in IL-1β production in patients with purulent foci is more pronounced than that of TNF-α, confirming the importance of IL-1β in the pathogenesis of purulent processes.

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