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HSP70 Gene Polymorphisms Probably Could Be Associated with Susceptibility to Chronic Periodontitis

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Dear Editor,

Chronic periodontitis (CP) is a multifactorial, immune-inflammatory disorder characterized by the progressive and irreversible degradation of the tooth-supporting apparatus, including the periodontal ligament and alveolar bone. The pathogenesis of CP typically begins with the colonization and proliferation of gram-negative bacterial species within the periodontal pockets, leading to the activation of local and systemic immune responses. Epidemiological data indicate that CP affects approximately 10 - 15% of the global adult population and remains the leading etiological factor responsible for tooth loss in this demographic. Cytokines, which function as pivotal inflammatory mediators, are central to the regulation and coordination of immune and inflammatory processes. They contribute significantly to the initiation, amplification, and perpetuation of inflammatory responses within periodontal tissues. In the context of periodontitis, elevated levels of these cytokines in the presence of bacterial pathogens and agents derived from these bacteria, such as lipopolysaccharides, can cause the development of inflammation and, through the production of prostaglandins, the induction of collagenases and other proteases, lead to destruction of periodontal tissues and tooth loss (1, 2).

The pathophysiological mechanisms underlying the onset and progression of periodontal disease are intricately linked to the dynamic interplay between periodontal pathogens residing in the dental biofilm and the host's immune-inflammatory defense system. It is this host-microbial interaction that ultimately determines the severity and outcome of periodontal tissue breakdown. Cellular immunity is modulated by the Th1 response, which includes the production of IFN-γ and IL2, and humoral immunity is modulated by the Th2 response and secretion of IL4, IL6, and IL10. Although immune responses in periodontal diseases are well known, the specific role of T cells in the local modulation of Th1 and Th2 responses is not fully understood (3).

Heat shock proteins (HSPs) are chaperones that participate in the process of folding other proteins, preventing the destruction of proteins, and their transport through membrane channels (4). Heat shock protein 70 (HSP70) or HSPA is a highly conserved compound in response to stress and is present in all living organisms, such as bacteria and humans. The role of this protein is to maintain and protect cells and stimulate them to repair damage caused by various stimuli. It is expressed in certain physiological conditions and stressful conditions such as environmental stress, temperature rise, infection, and inflammation (5).

The HSP70 proteins include several isoforms that are involved in the pathogenesis of many diseases, such as cancers to neurodegenerative diseases (6), and are expressed by many cells, including monocytes, macrophages, B-cells, and tumor cells derived from epithelial tissue (4). It has been found that the concentration of HSP70 protein in the inflamed gingival tissue and serum, as well as in the gingival crevicular fluid (GCF) of periodontitis patients, is higher than the normal value (7). Furuse et al. showed that with the start

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of periodontal treatments, the concentration of HSP70 in GCF fluid decreases, and this issue shows the presence of a direct relationship between the concentration of HSP70 and the progress of periodontitis (8). On the other hand, immunohistochemical studies have shown that HSPs are expressed in the basal surface of periodontal pockets. An increase in the proliferation of mononuclear inflammatory cells has also been observed in this area. In other words, periodontal bacteria can stimulate and increase the expression of HSPs by periodontal cells and direct macrophages and other inflammatory cells toward producing inflammatory cytokines, a mechanism that leads to tissue destruction and periodontitis disease (9).

The HSP70 assay can be considered as a probable potential biomarker in identifying the severity of periodontal diseases as well as monitoring the treatment. One of the factors that can lead to changes in the expression of HSPs is single nucleotide gene polymorphisms. In general, individuals' genetic backgrounds affect their susceptibility to many types of diseases and conditions. Studies published in recent years support the influence of genes on individuals' susceptibility to periodontal diseases (10). It seems that examining different polymorphisms of the HSP70 gene can also play an important role in the susceptibility to periodontal disease. We are conducting this study in our work team and recommend performing similar studies in other populations.

Footnotes

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