How plaque biofilm can be managed

By Fred Michmershuizen, Online Editor

Dental Tribune spoke with Dr. Fotinos Panagakos about his upcoming webinar.

**You have an upcoming course on the management of biofilm and gingival management. Would you please tell our readers why this topic is important?**

Periodontal diseases are a set of poly-microbial diseases characterized as dental-plaque/biofilm-induced gingival inflammation that without treatment can result in the loss of periodontal support tissues, bone loss, and, ultimately, tooth loss.

For the past several decades, significant clinical and basic research has established the complex microbiology and pathology of periodontal diseases, and, specifically, that they involve a combination of bacterial infection, host immune reaction and bone metabolism, as well as genetic and environmental risk factors.

The importance of bacterial plaque to the onset and progression of periodontal diseases is well accepted. While more than 400 species of bacteria can be detected in the oral cavity, only selective pathogenic species produce products harmful to gingival tissues.

Microbial products of specific pathogens, such as lipopolysaccharide (LPS) and proteolytic enzymes, directly or indirectly trigger a host tissue response by inducing inflammatory protein (cytokine) production, increasing the levels of inflammatory mediators, which leads to inflammation and tissue destruction.

Without intervention or treatment, supporting tissues will be destroyed, clinical pockets will form, bone resorption will occur, and, ultimately, the tooth will be lost.

**How does plaque biofilm affect the surrounding soft tissue?**

The plaque biofilm, if not removed, will trigger a chronic inflammatory disease of the gingiva and periodontium. This will result in the destruction of gingival connective tissue, periodontal ligament and alveolar bone. The periodontium responds to the tooth-borne biofilm by the process of inflammation.

The dental biofilm is composed of numerous bacteria, which tenaciously adhere to the tooth surface. Scientists are now beginning to understand the complex molecular interactions that occur, for example, between the bacteria and salivary pellicle that coats the tooth, and between gram-positive cocci of early plaque and gram-negative filamentous bacteria that populate the tooth as plaque matures.

Recent work has identified a set of complex signaling pathways referred to as quorum sensing — between bacteria, mediated by soluble chemicals produced by the bacteria.

Clinically, inflammation is seen as redness, swelling and bleeding upon probing. However, at molecular and cellular levels, the inflammatory process is defined as cellular infiltrates and the release of a variety of cytokines.

The main provoking factor that induces inflammation of gingival tissue is the presence of bacterial biofilm on the teeth/gingival interfaces.

The products of biofilm bacteria are known to initiate a chain of reactions in the tissue leading to host response as well as the destructive process.

**How can patients better manage plaque biofilm at home? Are there certain techniques and/or over-the-counter products that are especially beneficial?**

Control of the biofilm/plaque begins with daily oral hygiene. Mechanical cleaning of the teeth and associated gingival tissue removes the bulk of biofilm that has developed in the time since the last oral hygiene session. Within a few hours of meticulous tooth cleaning, bacteria colonize the tooth surface primarily around the gingival margin and inter-dental spaces.

The developing biofilm releases a variety of biologically active products...
ucts, including lipopolysaccharides [endotoxins], chemotactic peptides, protein toxins and organic acids. These molecules diffuse into the gingival epithelium to initiate the host response that eventually results in gingivitis and, in some circumstances, inflammatory periodontal diseases. Clinically, gingivitis is characterized by a change in color—from normal pink to red—with swelling and, often, sensitivity and tenderness.

Gentle probing of the gingival margin typically elicits bleeding when gingivitis is present. Because gingivitis is often not painful, it may remain untreated for many years. Lack of management at this stage may result in disease progression. This is why periodontal disease is often depicted as a spectrum of severity.

Given the complexity of periodontal diseases and the importance of oral health, one of the critical questions is how to best prevent and treat periodontal infection. Clinical procedures such as scaling and root planing provide immediate and universal benefits, whereas effective routine oral care can help maintain a healthy oral environment and decrease the occurrence of oral disease. It is interesting to speculate that a therapeutic agent that combines both antibacterial and anti-inflammatory efficacy may provide a unique and beneficial approach to the prevention and treatment of periodontal diseases via daily oral-care procedures, not only for high-risk individuals, but also for the general population. The current therapeutic strategy to control periodontal infections involves mechanical removal of deposits, both supra- and subgingival. This also could involve the use of topical and systemic antimicrobial agents.

Can topical antimicrobials applied via an oral delivery system, such as toothpaste, rinse, or gel, help with the management of dental biofilm?

A unique triclosan/copolymer/fluoride dentifrice technology, found in Colgate® Total®, has been developed and clinically proven to enhance conventional oral care procedures. This technology uses a patented system consisting of a broad-spectrum antibacterial agent, triclosan and a polyvinylmethylether/maleic acid (PVM/MA) copolymer to deliver sustained antibacterial activity in the oral cavity, thereby controlling dental plaque and preventing and treating gingival inflammation.

Triclosan is a broad-spectrum antibacterial agent that has been shown to kill oral pathogens, and clinically effective concentrations of triclosan are present up to 12 hours post-brushing, providing an anti-bacterial benefit between brushings. In practice, this triclosan/copolymer/fluoride dentifrice has been proven to deliver statistically significant and clinically relevant benefits in the prevention of caries, the reduction of dental calculus buildup and oral malodor, as well as the control of dental plaque and treatment of gingivitis.

Such a multi-benefit oral-care technology can significantly enhance routine oral care procedures and help to maintain a healthy oral environment. Control of the plaque biofilm through effective oral hygiene procedures, in combination with the use of a product such as Colgate Total, can provide most patients with an effective regimen to maintain good oral health between dental visits.

References