The Importance of the Synergistic Activity of Oral Bacteria in the Appearance and Evolution of Canine Periodontal Disease

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Periodontal disease is the most frequently occurring disease affecting 80% of the dogs over the age of 5. The disease occurs in response to a variable bacterial environment, complex interactions among the plaque bacteria and between the host and bacteria. Periodontal destruction can be substantial, leading to tooth loss, but it has also been suggested that PD has a systemic impact on the organism of the dog.

The complexity of plaque bacteria has been studied with various techniques such as the light and electron microscopy, cultural and DNA techniques. Recent techniques have revealed a plethora of subgingival microorganisms. Davis et al., suggested that in contrast to human, healthy canine plaque is dominated by Gram -negative bacterial species whereas Gram –positive anaerobic species predominate in disease with Peptostreptococcus, Actinomyces and Peptostreptococcaceae species being the most abundant in mild periodontitis[1].

The periodontal microbiota is a very complex ecologic system with many structural and physiologic interactions among the resident bacteria and between the bacteria and the host. Understanding the nature of the plaque biofilm can contribute to treatment of the disease. Little is known about the fluctuations in subgingival bacteria during the dynamic transition from health to disease, but the biofilm community begins to establish as quickly as 24 hours after professional scaling. The development of periodontal disease[2] provides an example of microbial succession and habitat interaction in the biofilm.

In the developing biofilm ecosystem, pioneering species colonize first. Holcombe, et al[3]. studied the main bacterial interactions in the early colonization of the enamel. They have demonstrated that the species with the highest relative abundance were Bergeyella zoohelcum, Neisseria shayeganii and a Moraxella species. Streptococcal species, which tend to dominate early human plaque biofilms, had very low relative abundance. In vitro testing of biofilm formation identified Neisseria genus as the most prevalent primary colonizing species. Pioneering species are often replaced by other after they have altered the habitat, making it more suitable for their successors. Moreover, a microorganism can have a certain role in one habitat, but a different one in another. Certain microbial species cannot proliferate in the absence of other, synergistic ones, while species’ virulence has been correlated with the severity of clinical parameters and symptoms such as gingival inflammation, gingival bleeding and oral malodour.

It seems that changes in the plaque[4] composition affect the habitat, leading to clinical gingivitis. In fact, Wallis et al. suggest that the colonization of the gingiva by health associated species may be more important in maintaining good oral health than targeting bacterial species associated with periodontal disease. In turn, gingivitis encourages other species to flourish leading to further deterioration of the disease. Gingivitis is a completely reversible stage of periodontal disease. However, inflammation of the rest of the periodontal[5] tissues known as periodontitis is irreversible and can only be halted to a certain magnitude of periodontal tissue destruction. The only way to stop this vicious circle is to eradicate dental plaque and limit early re-colonization. Professional
scaling is an indispensable step towards treating periodontal disease. Antimicrobials, anti-inflammatory medications and antiseptics are ancillary or essential in specific cases after scaling, but treatment will not suffice unless the owner is committed to maintaining his pets’ oral hygiene by brushing daily and/or using other products that help in microbial plaque control.

Periodontal disease is the most common canine disease which can cause pain and discomfort and can also affect the whole organism of the animal. Complex microbial communities⁶ act synergistically and interact with host defense eliciting inflammation and periodontal destruction. Antimicrobial therapy is ineffective in periodontal disease treatment without the mechanical removal of the calculus and microbial plaque from teeth surfaces and subgingival area, among others due to the nature of the plaque biofilm.

References