

A Paradigm Shift that will Change Clinical Practice

Central to our current understanding of periodontal disease development and progression is the idea that only specific periodontal pathogens cause periodontal disease and that all other bacteria present in the oral cavity are either beneficial or do not contribute to periodontal disease. Other factors that are believed to be necessary for periodontal destruction are that the bacterial load overcomes the host's ability to neutralize them and that one or more of the "red complex" bacteria (*Porphyromonas gingivalis*, *Treponema denticola*, *Tannerella forsythia*) must be present in the biofilm colony. Host-specific genetic factors resulting in impaired immune response also influence the development and progression of periodontal disease.

This old model of periodontal disease gave us plenty of time between gingivitis and periodontitis to "watch" the condition and to educate our patients to improve their homecare techniques and habits before the level of pathogenic bacteria built up to sufficient numbers to cause periodontitis. Upon detection of deeper pockets and evidence of radiographic bone loss, we became more concerned and began recommending various treatments.

POLYMICROBIAL SYNERGY & DYSBIOSIS

The new model of periodontal disease is called Polymicrobial Synergy and Dysbiosis. This refers to the entire colony of multiple different bacteria (polymicrobial) working together (synergy) to initiate a microbial imbalance (dysbiosis) resulting in periodontal disease, rather than by a few select bacteria known as "periodontal pathogens." The combined action of the entire bacterial colony is exponentially greater than the action of the individual microbes. This creates an imbalance in the microbial flora leading to inflammation and periodontal destruction.

Research has now demonstrated that the entire bacterial colony is involved in creating an increase in severity of oral inflammation and tissue destruction. This process is accomplished by inter-bacterial communication. Studies have established that colonization by key pathogens, such as *Porphyromonas gingivalis*, elevates the virulence of the entire bacterial colony by altering their gene expression, rendering them more aggressive. *P. gingivalis* flips the switch that converts bacteria, previously thought to be benign, into destructive microbes that contribute to periodontal disease progression. Research shows that *P. gingivalis* impairs host immunity, as well. For these reasons, *P. gingivalis* is now known as a keystone pathogen.

CLINICAL IMPLICATIONS

The concepts of keystone pathogens and Polymicrobial Synergy and Dysbiosis (PSD), have significant ramifications for the development of therapeutic options for periodontal disease. With the old model there was little urgency to treat periodontal disease in early stages. We believed increasing numbers of periodontal pathogens were required for periodontal destruction to occur. Now we know if even a low level of *P. gingivalis* (or other keystone bacteria yet to be identified) is present that the entire bacterial colony can become more toxic. This means that even in cases of early stage gingivitis, the focus should be on identifying the bacteria present and on efforts to control those bacteria before the disease progresses to full blown periodontitis. No longer do we have the luxury of time when it comes to treating gingivitis and possibly preventing periodontitis.

Salivary diagnostics are used to identify the specific bacteria present and to recommend targeted antibiotic therapy to reduce or eliminate those particular bacteria. Antibiotics alone are not enough to eliminate *P. gingivalis* though, because it is particularly difficult to eradicate. Treatment will likely involve a multi-faceted approach. This may mean using probiotics and other techniques to increase the number of beneficial bacteria, methods to bolster the defensive innate immunity, and the use of anti-inflammatory regimens. These treatments, and others, could render the host less susceptible to the bacterial challenge intensified by *P. gingivalis*.

[Knowledge and understanding](#) of the Polymicrobial Synergy and Dysbiosis model of periodontal disease will enable clinicians to develop more proactive and effective therapeutic approaches in the treatment of periodontal disease and prevention of disease recurrence.

Kathryn Gilliam, RDH, BA is a practicing dental hygienist and founder of PerioLinks, LLC, a training and coaching company dedicated to teaching dental professionals about the oral-systemic link and the early detection of oral cancer. Kathryn may be contacted at Kathryn@periolinks.com.