Understanding periodontal pathogenesis is key to improving management strategies for this common, complex disease. The first challenge is to understand exactly what is meant by the term pathogenesis. According to Merriam Webster’s Collegiate Dictionary, the word *pathogenesis* is defined as “the origination and development of a disease.” Essentially, this refers to the step-by-step processes that lead to the development of a disease and that result in a series of changes in the structure and function of, in this case, the periodontium. In broad terms, the pathogenesis of a disease is the mechanism by which a causative factor or factors causes the disease. The word itself is derived from the Greek roots *pathos* (meaning “suffering”) and *genesis* (meaning “generation or creation”).

Our knowledge of periodontal pathogenesis has evolved over the years. It is important to be aware of this, because treatment philosophies have similarly changed in parallel with our improving understanding of the disease processes. For example, during the late 1800s, Willoughby D. Miller (an eminent dental researcher who established the important causal role of oral bacteria for dental caries) asserted that “during the last few years the conviction has grown continually stronger, among physicians as well as dentists, that the human mouth, as a gathering-place and incubator of diverse pathogenic germs, performs a significant role in the production of varied disorders of the body, and that if many diseases whose origin is enveloped in mystery could be traced to their source, they would be found to have originated in the oral cavity.”

This marked the beginning of an era of dental treatment strategies that aimed to treat systemic diseases by eliminating the so-called “foci of infection” in the mouth. As a result, many patients underwent unnecessary dental clearances to manage their systemic diseases.

By the 1930s, such approaches were beginning to be questioned as evidenced by a clinical study of 200 patients with rheumatoid arthritis of whom 92 had their tonsils removed as treatment for the arthritis (even though only about 15% gave any history of tonsillitis or sore throat) and of whom 52 had some or all of their teeth removed. Of the 92 who had their tonsils removed, there was no impact on the arthritis in 86 patients (although 2 got worse); of the 52 who had teeth removed, there was no benefit in 47 cases (and 3 reported a worsening of their arthritis after the extractions). The authors wrote that “focal infection is a splendid example of a plausible medical theory which is in danger of being converted by its too enthusiastic supporters into the status of an accepted fact.”

The end of the focal infection era was signaled by an editorial in the *Journal of the American Medical Association* in 1952, which stated that “many patients with diseases presumably caused by foci of infection have not been relieved of their symptoms by removal of the foci, many patients with these same systemic diseases have no evident focus of infection, foci of infection are as common in apparently healthy persons as in those with disease.”

Advances in the management of periodontitis have been driven by improved knowledge of the epidemiology, causation, and pathogenesis of the disease. During the 1970s, the role of plaque as the sole causative factor for periodontitis was unquestioned. In those days, nonsurgical treatment was in its infancy, and most treatment options involved surgery (e.g., gingivectomy for the treatment of shallower pockets, access flap surgery for the treatment of deeper sites). When looking back, it becomes clear that the treatment strategies used during a given time period are entirely dependent on the prevailing understanding of pathogenesis at that particular point in time. It is therefore very likely that the management options that we take for granted now will change again in the future. This is to be welcomed, because a progressive clinical discipline such as periodontology that is well founded in science and with patient benefit as its primary value should strive to improve therapeutic strategies in the light of continued discovery.

Periodontal disease results from a complex interplay between the subgingival biofilm and the host immune–inflammatory events that develop in the gingival and periodontal tissues in response to the challenge presented by the bacteria. It is generally accepted that gingivitis precedes periodontitis, but it is clear that not all cases of gingivitis progress to periodontitis. With gingivitis, the inflammatory lesion is confined to the gingiva; however, with periodontitis, the inflammatory processes extend to additionally affect the periodontal ligament and the alveolar bone. The net result of these inflammatory changes is the breakdown of the fibers of the periodontal ligament, resulting in clinical loss of attachment together with resorption of the alveolar bone.

During the 1970s and 1980s, bacterial plaque was generally considered to be preeminent as the cause of periodontitis. At that time, it was accepted that poor oral hygiene resulted in increased plaque accumulation, which in turn resulted in periodontal disease.
However, this model failed to take into account observations such as the fact that there are many individuals with poor oral hygiene who do not develop advanced periodontal disease and, conversely, that there are unfortunate individuals who, despite good oral hygiene and compliance with periodontal treatment protocols, continue to experience progressive periodontal breakdown and who would be considered to have aggressive periodontitis. These findings were confirmed by the work of Löe and colleagues, who studied Sri Lankan tea laborers who had no access to dental care and who could be divided into three main categories: (1) individuals (≈8% of the population studied) who had a rapid progression of periodontal disease; (2) those (≈81%) who had a moderate progression of such disease; and (3) those (≈11%) who demonstrated no progression of periodontal disease beyond gingivitis. All patients in this population displayed abundant plaque and calculus deposits. The causative role of plaque bacteria is clear in that the bacteria initiate and perpetuate the inflammatory responses occurring if they are attached to the underlying tooth and bone, with minimal bleeding on probing. The dentogingival junction is a unique anatomic feature that functions to attach the gingiva to the tooth. It comprises an epithelial portion and a connective tissue portion, both of which are of fundamental importance for periodontal pathogenesis. The epithelial portion can be divided into three distinct epithelial structures: the gingival epithelium, the sulcular epithelium, and the junctional epithelium (Figure 5-1). These epithelial structures are in continuity with each other, but they have distinct structures and functions as indicated in Box 5-1.

The junctional epithelium is a particularly unique epithelial structure, because the surface cells are specialized for the purpose of attachment to the tooth. Therefore, unlike other epithelial tissues elsewhere in the body, there is no opportunity for the sloughing of cells from the surface. Instead, cells at the basal layer and causing tissue damage. Our current understanding of susceptibility to periodontitis suggests that individuals who are more susceptible to the disease mount an excessive or dysregulated immune–inflammatory response for a given bacterial challenge, which leads to increased tissue breakdown as compared with those individuals who have a more normal inflammatory response.

**Clinically Healthy Gingival Tissues**

Clinically healthy gingival tissues (e.g., those observed in patients with excellent oral hygiene and no visible plaque deposits who typically have received regular and meticulous professional cleaning) are pink in appearance, not swollen, not inflamed, and firmly attached to the underlying tooth and bone, with minimal bleeding on probing. The dentogingival junction is a unique anatomic feature that functions to attach the gingiva to the tooth. It comprises an epithelial portion and a connective tissue portion, both of which are of fundamental importance for periodontal pathogenesis. The epithelial portion can be divided into three distinct epithelial structures: the gingival epithelium, the sulcular epithelium, and the junctional epithelium (Figure 5-1). These epithelial structures are in continuity with each other, but they have distinct structures and functions as indicated in Box 5-1.

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**Histopathology of Periodontal Disease**

To better understand periodontal pathogenesis, it is important to have an appreciation of the histologic appearance of clinically healthy tissues as well as of inflamed gingival and periodontal tissues. It is important to note that, even in gingival tissues that clinically would be considered to be noninflamed and healthy, there is always evidence of inflammatory responses occurring if they are examined microscopically. This is normal given that there is a chronic low-grade challenge presented by the subgingival plaque bacteria. The low-grade inflammatory response that results is not detectable macroscopically at the clinical level, but it is an essential protective mechanism for combating the microbial challenge and for preventing bacteria and their products from infiltrating tissues and causing tissue damage. Our current understanding of susceptibility to periodontitis suggests that individuals who are more susceptible to the disease mount an excessive or dysregulated immune–inflammatory response for a given bacterial challenge, which leads to increased tissue breakdown as compared with those individuals who have a more normal inflammatory response.