

# The oral-systemic disease connection

## An update for the practicing dentist

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**W**hile the practicing dentist always has had an appreciation for the importance of oral health, research reports and articles in the lay press during the past 25 years or so have done much to bring this to the attention of our medical colleagues and the public at large. In particular, the possibility that events in the oral cavity can influence systemic disease has been highlighted by the U.S. surgeon general's report in 2000<sup>1</sup> and in numerous reports of investigations into associations and interactions between oral disease—particularly periodontal disease—and coronary heart disease, stroke, adverse pregnancy outcomes, diabetes and bacterial pneumonia.

The reported studies have included epidemiologic studies, intervention studies and studies seeking to elucidate mechanisms of action. Results of different studies have, at times, been contradictory, which is not surprising given the variations in study design, populations studied and statistical analyses used in the plethora of reported studies. This, however, creates a dilemma for those not inti-

mately involved in this area of research. What are we, as practicing dentists, to make of all this? What can we authoritatively tell our patients in response to their inquiries regarding relationships between oral and systemic diseases?

The purpose of this supplement is to provide an update of the field that will enable us to respond with the latest information to questions our patients might ask.

### FOCAL INFECTION THEORY

The concept that oral conditions can significantly influence events elsewhere in the body is not new, but it has undergone a number of iterations over the years.<sup>2-5</sup> A frequently cited early publication is an 1891 report by Miller entitled "The Human Mouth as a Focus of Infection."<sup>6</sup> Miller was highly attuned to the role of bacteria in disease causation, as he was working in the laboratory of Robert Koch, whose postulates were used to establish the microbial etiologies of infectious diseases. Miller proposed a role for oral microorganisms or their products in the development of a variety of diseases in sites removed from the oral cavity, including brain abscesses, pul-

monary diseases and gastric problems, as well as a number of systemic infectious diseases.

The role of oral sepsis as a cause of systemic disease was championed by William Hunter, a prominent British physician, in a publication<sup>7</sup> and a 1910 talk at McGill University, Montreal.<sup>2</sup> He spoke, with considerable hyperbole, of dental restorations "built in, on, and around diseased teeth which form a veritable mausoleum of gold over a mass of sepsis to which there is no parallel in the whole realm of medicine."<sup>2</sup> In 1919, Rosenow<sup>8</sup> published a series of animal experiments and human case reports supporting the concept of focal infection. He emphasized the importance of cooperation between dentists and physicians, as well as the necessity of ensuring that the focus of infection is eliminated completely, and he noted that tooth extraction by itself might not be sufficient.

Much of the evidence presented in support of the concept of focal infection proved, on closer inspection, to be anecdotal or of questionable scientific merit. Nevertheless, it became common practice to extract all endodontically or periodontally involved teeth to eliminate any

possible foci of infection, with the expectation that this would prevent or cure a whole host of local or systemic problems.

### **A MORE SCIENTIFIC APPROACH**

By about 1930, the validity of the focal infection theory began to be questioned, and investigators found, when they considered the available real outcome data, that there was no clear basis for ascribing the occurrence of much systemic disease to the presence of oral foci of infection. As a result, the focus of dental practice changed such that restorative dental procedures re-emerged as the mainstay of most dental treatment plans. However, as a more scientific approach was applied to investigating clinical problems, it became clear that, in fact, there were situations in which oral bacteria could affect distant structures, in particular the case of bacterial endocarditis in susceptible people.

Beginning in the late 1980s, a series of publications regarding the association between periodontitis and some systemic conditions, especially coronary heart disease and, to a lesser degree, stroke and preterm birth/low birth weight, captured the attention of the dental profession. In some sense, this can be construed as a return to the theory of focal infection. However, the response of the dental and medical professions this time was considerably more measured than that in the early part of the 20th century.

This is likely a result of several factors: the greater sophistication in methods of scientific investigation and statistical analysis, including an under-

standing of the limits of epidemiologic studies in establishing disease causality<sup>9</sup>; a markedly enhanced understanding of the etiology and pathogenesis of periodontal diseases and associated systemic diseases that permits an assessment of the biological plausibility of putative interactions; the availability of successful methods of treating periodontal disease and endodontic lesions; and the recognition that bacteria could in some way be responsible for diseases that

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heretofore had a rather uncertain etiology (for example, evidence documenting the etiologic role of *Helicobacter pylori* in the development of gastric ulcers—not an exact analogy to be sure, but a useful one).

In considering the existing data, it is important to differentiate between those data supporting an association between two diseases or conditions and those indicating a causal relationship, so that the information can be interpreted accurately. Although oral microorganisms from various sites potentially could be associated with systemic disease, the articles in this supplement focus on the connection between dental plaque and periodontal disease and adverse pregnancy outcomes, cardiovascular disease, bacterial pneumonia and diabetes, as well as the methods

by which the data are analyzed and the issues involved in study design and interpretation.

Each article presents the current state of the field, indicates questions remaining to be answered and the studies needed to accomplish this, and provides a brief summation that can guide dentists' responses to patients' inquiries. I need to emphasize that the investigation into oral-systemic disease connections is a rapidly advancing area of research, and that new information is constantly appearing in the literature. As the field develops further, we can anticipate a time when the vision set out in the surgeon general's report will be achieved, confirming that dental care and oral health play a key role in helping to ensure the overall good health of our patients. ■

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