



# Exploring the Link between Oral Health & Systemic Disease



By Julie Edwards from interviews conducted

By Christine A. Hovliaras-DeLozier, RDH, BS, MBA

## Is There an Oral-Systemic Link?

What the oral health care literature sometimes called the oral-systemic link “is more accurately designated as a periodontal disease-systemic relationship,” explained Robert J. Genco, DDS, PhD, professor at The State University of New York in Buffalo, N.Y., and in the affiliated Roswell Park Cancer Institute, who is also the editor-in-chief of the *Journal of Periodontology*. “There is really no other oral condition that has been related to systemic disease—and people have looked at endodontic lesions and caries.

“It began by looking at the relationship of diabetes mellitus

to periodontal disease. We and others showed that a [person with diabetes] very clearly has a greater risk for having or developing periodontal disease. Then we looked at the relationship over time between [people who have diabetes] with periodontal disease and those without—and found that in those with periodontal disease, their diabetes got worse. Specifically, their glycosylated hemoglobin worsened over time. So that has a lot of us thinking that maybe these are two-way interactions.”

Genco recalled other research conducted in the late 1980s, about the same time as his study of people with diabetes. “McKellar and his colleagues wrote about a relationship between periodontal disease and cardiovascular disease. Now,

there are about 16 or 17 epidemiologic studies showing that relationship. Then in the mid-’90s, Offenbacher showed that there was a relationship between periodontal disease in pregnant women and low-birth-weight, premature babies. About the same time, Scannapieco and others showed a relationship between, essentially, poor oral hygiene and periodontal disease and respiratory infections that he confirmed in institutionalized patients in medical or surgical intensive care units and nursing homes.

“In all of these areas, both cross-sectional and longitudinal studies have been carried out,” Genco said. “And by and large, they have been positive, although there are some negative studies.”

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little bit careful because there are some studies that also counter some of these trends that we’re seeing,” agreed Nadeem Karimbux, DMD, MMS, assistant dean of Dental Education and associate professor at the Harvard School of Dental Medicine in Boston, Mass., and a practicing periodontist who is also involved in clinical trial work.

“It seems like there are these

links between periodontitis and heart disease and the preterm, low-birth-weight babies. But I’m not too comfortable saying there’s a very, very clear ‘cause’ type of relationship, yet,” he said.

Louis F. Rose, DDS, MD, a practicing periodontist as well as a clinical professor at the University of Pennsylvania in Philadelphia and New York University in New York City, shared Karimbux’s reticence, while he acknowledged some of the research that Genco pointed to. “I am very cautious as to how this [oral-systemic link message] is conveyed to the public,” he said. “There is an association between oral infection and, in this case, periodontitis and some of the systemic disorders like cardiovascular disease, diabetes, and low-birth-weight babies [but] I hesitate, with some of them, to say that there is a cause-and-effect relationship.

“There are some pilot intervention studies that demonstrate that if you treat periodontal disease, you will see a change in the glycemic control [of patients with diabetes]. And Dr. Offenbacher has been able to demonstrate a strong link between periodontal disease and low-birth-weight babies, so there is some strong research in those two areas,” said Rose.

And lack of a true cause-and-effect relationship does not imply that treating periodontal disease doesn’t make a difference to systemic health. More research is needed to confirm the relationship.

## Inflammation and More

“In a [patient with diabetes], the glycosylated hemoglobin does not go back to normal but is improved by periodontal therapy, in randomized, controlled studies,” Genco said. “[Furthermore,] pilot studies show that treatment of periodontal disease in pregnant women at high risk for low-birth-weight [babies] reduces the rate of low birth weight.” In addition, he noted, “There have been five studies of intensive care unit or nursing home patients showing that simple oral hygiene measures like daily swabbing with chlorhexidine will reduce respiratory infections by half.

“When you have poor oral hygiene taken to the extreme—for example, when a person spends a week in

intensive care without any control—oropharyngeal flora becomes colonized by respiratory pathogens that cause lung disease and pneumonia,” Genco continued. “They are not normally present in the oral flora for people who practice plaque control. In nursing homes and intensive care units, not only is the oral flora of these patients infected with these respiratory pathogens, but their respiration is compromised. They swallow or aspirate the organisms and cannot get rid of them. They cannot cough them up, so they get pneumonia. So the respiratory connection is probably a direct bacterial invasion.”

On the other hand, in the case of diabetes, heart disease, and low-birth-weight babies, “The plausible mechanism might be mediated through inflammatory factors,” said Genco.

“Plaque is a bacterial challenge to the body. It’s an infection. Patients don’t think of that,” said JoAnn Gurenlian, RDH, PhD, president of Gurenlian & Associates, a Haddonfield, N.J., firm that provides health-related continuing education and consulting services, and a part-time medical history taker in a medical practice. Gurenlian sees the relationship between oral and systemic health as “an opportunity to be a better practitioner. We are evaluating the whole patient and putting together a comprehensive picture of the nature of the findings of a person’s oral health in relation to their total health,” she said.

Gurenlian explained that an inflammatory response is how the body attempts to defend itself against infection. Sometimes, however, inflammation becomes chronic. “Destructive changes occur that can affect what’s happening in the mouth and other parts of the body. This places patients at risk for other diseases, and that’s where we see this connection between oral health and systemic disease.”

“Hygienists need to understand that most chronic disease states in the human body have inflammation as a common etiology,” added Ann Eshenaur Spolarich, RDH, PhD, a consultant and dental hygiene practitioner who also teaches at the Arizona School of Dentistry and Oral Health in Mesa, Ariz. and the University of Southern California School of Dentistry in Los Angeles, Calif.

“Inflammatory mediators (or cytokines) are important chemicals that are messengers in the body, but they are also the chemicals that lead to tissue destruction and detrimental effects,” she said. “So when we look at a patient’s risk factors, we have to consider the role inflammation is playing in what’s going on—not just in the mouth but also systemically.

“One mediator is tumor necrosis factor-alpha—a cytokine that is secreted by fat cells, which can prevent insulin from working,” Spolarich continued. “Chronic inflammation increases the production of this cytokine, and elevated levels of TNF are associated with insulin resistance. This may explain one mechanism of how periodontal infection contributes to insulin resistance and poor glycemic control in diabetic patients.”

“C-reactive protein is a cytokine made by your liver in response to inflammation,” added Spolarich. “C-reactive protein is dangerous because it increases your risk for clot-

ting. It's a marker for heart disease. When people have oral inflammation, their C-reactive protein levels increase."

The oral health professional attempting to stay abreast of systemic health research can quickly become overwhelmed, but Gurenlian recommended perseverance. "Read the scientific literature—and not just the dental literature," she urged. "If you don't understand it, ask someone to explain it. Read product literature and learn how to evaluate the research behind it: before you recommend a product to a patient, know why you are recommending it."

## Who Is at Risk?

Genco recommended caution when attempting to categorize patient risk based on the research to date. "We really cannot say that management of periodontal disease will have any effect on heart disease. I think what we can say is that there are patients who have heart disease and periodontal disease who often have the same set of risk factors, such as obesity and smoking, and that it is probably good for the dental team to be looking at these patients as high-risk patients for both diseases and trying to do something about the risk factors; for example, getting them to stop smoking. Or if [they have diabetes], getting them to make sure their diabetes is controlled."

Marilyn Cortell, RDH, MS, is assistant professor at New York City College of Technology and adjunct professor at New York University, also in New York City. When asked which patients she feels are most at risk for health problems that bridge the oral and systemic boundaries, Cortell responded, "Every single patient is at risk for a variety of reasons. But some people are more predisposed. This includes those who had previous periodontal disease, smokers, [people with diabetes], patients with hypertension and coronary artery disease, those with rheumatoid arthritis, patients with respiratory disease including asthma, pregnant women (especially those lacking access to prenatal care), postmenopausal women, overweight patients, and patients lacking good diet and exercise."

When asked to define "at-risk" patients, Gurenlian's first response was "people 40 and over." But she modified her answer to include people at risk for diabetes—which can be adolescents and teens. Her list also included pregnant women, smokers, and those with evidence of high blood pressure. In addition, she reminded dental hygienists to watch for diseases (such as diabetes) that affect certain ethnic/racial groups disproportionately.

"Smokers and [people with diabetes] are at high risk, as are patients with a positive IL-1 genotype," said Spolarich. "These people are at greater risk for severe periodontal disease. Having a positive genotype and smoking synergistically increases risk. Patients with genetic disorders, such as Down syndrome or Papillon-LeFevre syndrome, also have higher periodontal disease susceptibility."

For patients with cardiovascular issues, Spolarich emphasized the importance of smoking cessation. For patients with diabetes, she stresses the need for regular blood sugar testing and being vigilant about keeping blood sugar under control. "If they don't control their sugar, no matter what we do, the effects won't last."

Regarding pregnant women, she said, "Emerging literature supports the idea that regular scaling and root planing during pregnancy help decrease the risk of preterm, low-birth-weight babies.

"It is beneficial and safe for pregnant women to use antimicrobial rinses and triclosan toothpaste," Spolarich added. "There is no evidence to show that these topical products harm the fetus."

"The connection between oral disease and preterm low-birth-weight babies is strong, and it is incumbent on us to communicate this regularly to our pregnant patients," said Cortell. "In order for the cervix to prepare for dilation, prostaglandins must be present.

Pregnant patients who present with oral infections, such as periodontal disease, will have prostaglandins released into the bloodstream that can lead to premature cervical changes, which may promote premature labor. It is well known in the field of obstetrics that undiagnosed and untreated urinary tract infections can lead to premature labor, therefore, oral infections cannot be overlooked."

In Rose's office, women of child-bearing age are offered pamphlets on periodontal disease and pregnancy and other systemic conditions, and the relationship is discussed in the operatory. "There really is no good documented evidence that you cannot treat women during the first trimester," Rose said, explaining that the rationale against treatment early in pregnancy has been avoidance of an inessential, potentially traumatic event. "But if the patient has an infection, or let us say periodontal disease, it is a good idea," he said, adding, "The best time to treat is always the second trimester, and that is what I do."

## What the Dental Hygienist Should Be Doing

As understanding of the relationships between oral and systemic health and disease continues to develop, so does the role of the dental hygienist. While patient assessment, education and recommendations for products and home care are as important as ever, the content is beginning to change.

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“Before you can develop a treatment plan, you have to do a comprehensive assessment,” said Gurenlian. “[This includes] a thorough medical history, vital signs, an oral exam, glucose monitoring for those with diabetes or prediabetes, radiography, periodontal diagnostics and a risk-factor assessment for those with indications of major systemic disease.”

However, she said, dental hygienists may not be doing comprehensive assessments because their time with the patient is limited. Therefore, initial appointments may need to be lengthened—or more than one appointment may need to be scheduled. Patients can be charged for the extra care they’re receiving. “Make patients realize that they are getting a tremendous service for the time they’ve invested,” she suggested.

Part of this service is a complete periodontal probing, Gurenlian said, because probing can provide so much information. She used as an example a hypothetical lupus patient on steroids who appeared, at first glance, not to have much gingival inflammation. In such a patient, probing could uncover significant periodontal problems.

“Periodontal probing should be performed on every new patient and routinely monitored, with an emphasis on clinical attachment loss, recording recession, mobility, furcations, and a radiographic observation,” agreed Cortell. “The presence, amount, and thickness of saliva should be noted. Also, the patient’s existing oral hygiene protocol should be assessed. All of these factors are considered together and evaluated to identify risk for oral disease, establish a diagnosis, then formulate an appropriate treatment plan and homecare protocol,” she said.

Cortell also stressed the importance of maintaining a complete medical history including updated information on current physicians and any pharmacologic/homeopathic agents the patient may be taking. And she said that it is essential that dental hygienists have ready access to a drug handbook. “The dental hygienist should know what drugs patients are taking, who prescribed them, and why they’re taking them,” she said. “Some patients are taking drugs for off-label uses. It’s also important to know whether there are side effects that can cause oral complications.”

When it comes to the medical history, Gurenlian preferred a “review of systems” approach, which helps identify signs and symptoms of disease. She stressed the importance

of asking follow-up questions, and said that patients must be made aware of their own risk factors. If there are concerns about a condition such as diabetes, the dental hygienist may suggest that the patient see a physician—and even advise the patient on which lab tests to request.

Gurenlian considered it essential for patients to understand that, when they come in for their appointment, it’s not just to get their teeth cleaned. “They’re going to learn more about their bodies than ever before,” she said. “When we talk about diabetes, cardiovascular disease, respiratory diseases, and preterm, low-birth-weight babies, we understand through our research—particularly over the last 10 years—that there appear to be relationships between oral health and these particular systemic diseases. The relationship will vary depending on the systemic disease.”

In general, oral health care providers do a relatively poor job of talking to patients about risk and prevention, Karimbux believed. In comparison, he felt that the American Heart Association and the field of dermatology have done a good job of taking the literature and transmitting what’s been learned about risk to the general population, so that it has become mainstream to talk about the risk factors for cardiovascular disease and skin cancer.

“The kind of continuing education courses that we take as health care providers don’t get that kind of information out—or it’s just not as sexy a topic, shall I say, as something in aesthetics or new materials or implants,” he explained. “People tend to choose the other types of topics, to learn how to do procedures rather than to talk about prevention and risk. And so the message itself gets lost somewhere, due to the infrastructure that we’ve set up—and due to the kind of continuing education courses that people are taking.”

Rose said that he likes to use medical analogies when talking to patients. “Dentists do not like to talk in these terms a lot, but it really gets the point across and that is to say to a patient: ‘Disease in your mouth is no different from a urinary tract infection. It is a bacterial infection and you would treat immediately a bacterial infection of the urinary tract. The same thing is true for your mouth.’” He said that he always ends by telling patients, “There is a lot more research that needs to be done, but periodontal disease is preventable and should be treated. And at this point in time, since we know there is an association, regarding the oral-systemic link, then why not treat it?”

“When talking to patients, explain that bleeding is a sign of disease. Don’t sugarcoat this—be very direct,” said Spolarich. For all patients, regardless of systemic disease, she recommends good mechanical plaque removal and the use of antimicrobial rinses such as chlorhexidine and Listerine®. She noted that the triclosan in Colgate® Total® toothpaste reduces bacteria and two types of cytokines. In addition, she said, it’s important to get people to clean between their teeth, whether with floss or other products.

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The goal of the dental hygienist, according to Cortell, is to obtain the optimum oral hygiene status for the patient/client. "That would include the use and application of any of the myriad of products available to the patient over the counter," she said. Cortell suggested individualizing product recommendations. "Everybody has some level of risk. Those with an increased level of risk are treated more aggressively, for example, by recommending an antimicrobial rinse. But that wouldn't be any different for me treating a [patient with diabetes] than treating a patient with coronary artery disease," she said. "I feel my recommendations would be very close and overlapping."

Asked about recommendations dental hygienists should make to patients, Karimbux mentioned electric devices/brushes (the ones that rotate and oscillate) as well as the importance of brushing twice daily and flossing at least once daily. He also encouraged the use of technology such as Web sites and CDs to help patients learn good technique. "Anything we can do to motivate patients to take better care of their oral health," he recommended.

Rose stressed the importance of oral health care professionals participating in communication and interdisciplinary care. "We need to work with our medical colleagues. They need to work with us." He said that if the dental hygienist has concerns about a patient, he or she should tell the dentist. If the dentist thinks the patient has clinical signs and symptoms of a medical condition such as diabetes, the patient should be referred to a physician. "I do not think at this point that we are ready to make medical diagnoses in the dental office," Rose cautioned.

Cortell considered that the oral-systemic link provides an opportunity for the profession of dental hygiene to enhance its professional image. "We can let the public know who we are, what we do, and how well educated we are," she said, adding, "It's part of our role as professionals to understand the research and engage in dialog with patients to inform them of the increasing evidence and clinical data that support the concept that the mouth is clearly connected to the rest of the body."

## Diagnosics in the Office

Opinion varies as to how sophisticated in-office diagnostic tests need to be. Gurenlian, whose basic requirements for comprehensive patient assessment were outlined in the previous section, also saw value in the more advanced diagnostics. Among the tests she may employ are bacteriologic monitoring (for those with aggressive periodontal disease), saliva testing, caries testing, and genetic testing for periodontal disease.

"I think that if you talk about periodontal disease, yes, microbiology testing is important in some patients," Rose said. "Gingival crevicular fluid and microbiology studies may be valuable when used properly in the right patients, but I do not think that they are an absolute necessity.

"Vital signs, blood pressure, and pulse are important to do," Rose said. "I would like to know about their smoking history."

As for the tests that Spolarich considers indispensable, "All dental hygienists should be taking patients' blood pressures. In addition, there is a test called the HbA1c which measures long-

term blood sugar control four times a year. The test is now available over the counter, so it could be used in the dental office.

"Hygienists should know that there are genetic tests for periodontal disease," Spolarich continued. "One, called a PST<sup>®</sup> Genetic Test, looks for genetic markers for periodontal disease. It's an expensive test, and not all dental offices are equipped to do it."

"I think the diagnostic field will at some point catch up with what we know currently about these diseases," Karimbux said, adding, "We're not there yet, even with sampling of plaque and DNA probe technology. It's really not helpful to know all that information because it still doesn't change the basic way we treat our patients. There just haven't been enough studies yet to say, if the patient has a certain profile, that if we treat them in a different way from our traditional ways, they're going to do any better.

"I think, in an ideal world, expanding screenings is desirable," Karimbux continued. "We do see a subset of the population perhaps much more frequently than our physician colleagues see them. And we could be providing a service for patients and for physicians, in terms of making referrals, by doing this. I think what's difficult is the way we're set up as health care providers. Reimbursement and time become issues. From an infrastructure/training perspective, we're really not set up to provide those services, follow up, get results back, [and] interpret them."

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## The Next Big Things

"I think this whole area is an exciting work in progress," Karimbux said. "I think we've found some links that really do show that there are effects of having periodontitis on systemic types of issues such as preterm, low-birth-weight babies and cardiovascular disease. I think the larger case-controlled studies currently being done will hopefully help us make even clearer statements about these links.

"From a therapy standpoint, the future is really exciting, given what I believe will happen with diagnostics and therapeutics, where we can really take diagnostic tools, identify patients at risk, and start to make tailor-made types of treatment plans for our patients that will help treat these diseases and also prevent not only dental disease but perhaps have a real impact on systemic diseases," Karimbux added.

Genco also expressed the need for additional research, specifically citing the need for more information on the effect of periodontal management on complications associated with dia-

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—Nadeem Karimbux, DMD, MMS

betes, including kidney disease, retinopathy, and neuropathy. Rose recognized that the relationship of oral health to systemic health has implications for dentistry as well as its consumers. "I think that this is probably the most important research or findings in dentistry in many years, and this definitely puts us in the arena of health care and not treating just the oral cavity," he said. "We are health care professionals helping people to stay orally, systemically, and emotionally healthy."

Spolarich stressed how important it is for dental hygienists to keep up with continuing education in order to be comfortable with the whole concept of risk factors. "Keep reading," she said.

"You have to try to actively stay current. And remember that risk prevention is the best risk-reduction strategy."

"Being a hygienist today is playing a multifaceted role," added Cortell. "We need to learn and understand so much more than ever. My advice is to stay current, read, ask questions, and utilize personal experience. Be creative in meeting treatment outcomes for patients, and know that one size doesn't fit all."

"We have to give up the way we practice now," Gurenlian acknowledged. "We have to reframe the dental hygiene appointment. Help patients understand that we're practicing oral medicine. Help patients understand that we're practicing oral medicine."

"We've learned so much more, and our research tells us this is what we need to do," she said. "Our patients are worth it."

Julie Edwards is a freelance writer in Chicago. Christine A. Hovliaras-Delozier, RDH, BS, MBA, is editor-in-chief of Access.

### To learn more...

These six experts have provided a wealth of information on this fascinating topic. If you'd like to learn more, visit: [www.nidcr.nih.gov/HealthInformation/DiseasesAndConditions/OralSystemicHealthConnection/OralSystemic.htm](http://www.nidcr.nih.gov/HealthInformation/DiseasesAndConditions/OralSystemicHealthConnection/OralSystemic.htm).



Marilyn Cortell, RDH, MS, is assistant professor at New York City College of Technology Department of Dental Hygiene and adjunct clinical professor at New York University. She is a contributor to prominent dental hygiene textbooks, a consultant member for the North East Regional Board of Dental Examiners and lectures internationally on relevant dental related topics.



Nadeem Karimbux, DMD, MMS, is an associate professor of periodontology in the Department of Oral Medicine, Immunology and Infectious Disease at the Harvard School of Dental Medicine. He is the assistant dean of dental education. Dr. Karimbux has lectured nationally and internationally on the topic of periodontal disease and systemic links, and has published over 30 articles in journals and textbooks.



Robert Genco, DDS, PhD, is a periodontist with a doctorate in microbiology and immunology. He has been a faculty member at the University at Buffalo for over three decades. He participated in the writing of 11 textbooks, including Contemporary Periodontics, and is presently editor-in-chief of the Journal of Periodontology and has received the ADA Gold Medal for Excellence in Research and the ADA Award for Clinical Research. Dr. Genco's pioneering research established smoking, diabetes mellitus, low dietary calcium, osteoporosis and stress as risk factors for periodontal infections. This research

has led to a new paradigm in the management of periodontal disease by treating the infection, regenerating tissue, and controlling risk factors, which is presently practiced worldwide.



Louis F. Rose, DDS, MD, clinical professor of periodontics at both the University of Pennsylvania and at New York University School of Dentistry, is on the faculty of Harvard University School of Dentistry and professor of surgery at Drexel University College of Medicine. He is a Diplomate of the American Board of Periodontology and is a member of many editorial advisory boards. He maintains a private practice for periodontics and implant dentistry and speaks nationally and internationally. Dr. Rose is the author of Internal Medicine for Dentistry, Periodontal Medicine, and Periodontics: Medicine, Surgery and Implants, published in 2004.



JoAnn R. Gurenlian, RDH, PhD, is the owner of Gurenlian & Associates. She provides consulting and continuing education programs for health care providers. She has experience in general, periodontic, pediatric and orthodontic practices, and works part-time in a medical practice. She is an internationally recognized speaker on the topics of oral pathology, oral medicine, diabetes, and women's health. Dr. Gurenlian volunteers with local cancer, health and political organizations.



Ann Eshenaur Spolarich, RDH, PhD, has published over 60 original scholarly works and serves on several editorial boards. She provides research and educational consulting services to both private and professional organizations as an independent contractor, and practices dental hygiene part-time. Dr. Spolarich currently teaches clinical medicine and pharmacology at the Arizona School of Dentistry and Oral Health, and is a visiting faculty member at the University of Maryland Dental School and the University of Southern California Dental School.