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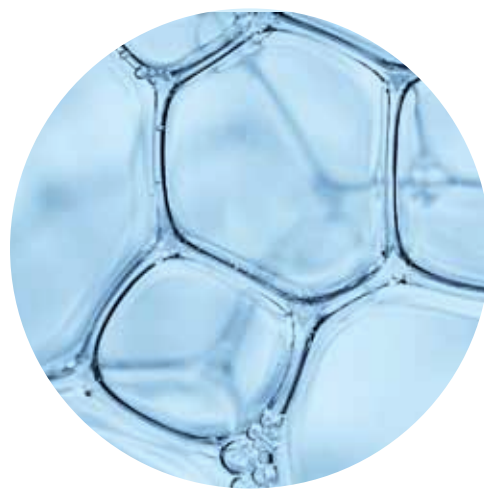
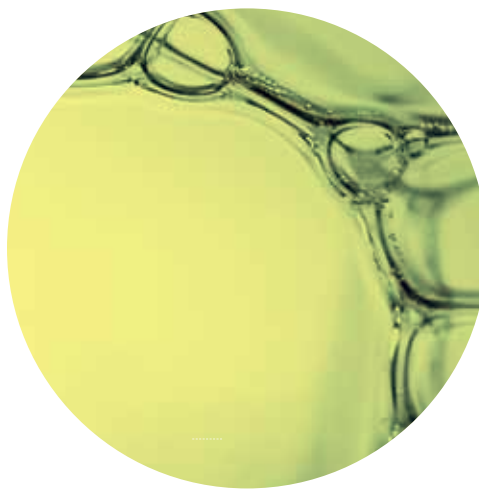
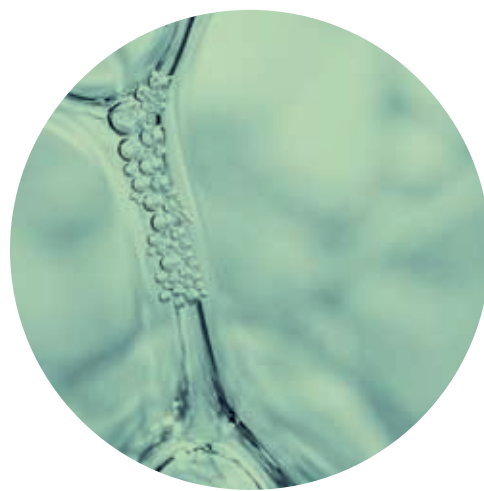
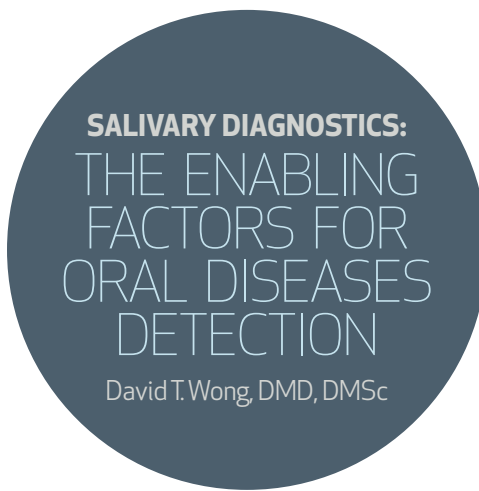
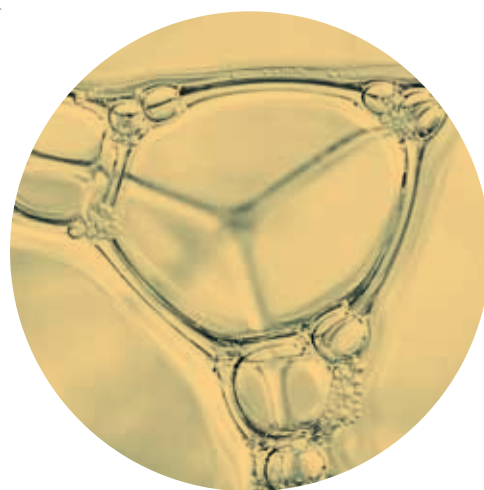
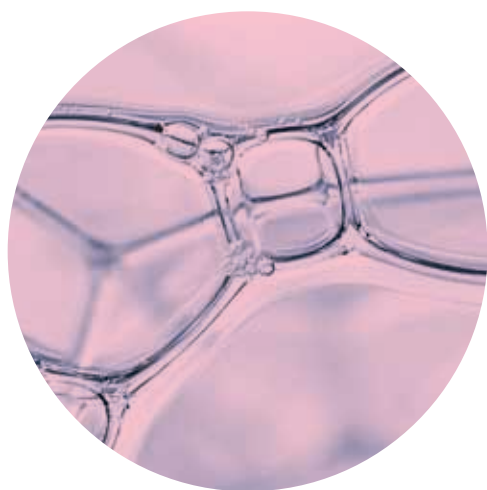
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Journal

OF THE CALIFORNIA DENTAL ASSOCIATION

CDA Journal
Volume 41, Number 2
FEBRUARY 2013

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The subscription rate is \$18 for all active members of the association. The subscription rate for others is as follows:
Non-CDA members and institutional: \$40
Non-ADA member dentists: \$75
Foreign: \$80
Single copies: \$10
Subscriptions may commence at any time. Please contact:

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Journal of the California Dental Association (ISSN 1043-2256) is published monthly by the California Dental Association, 1201 K St., 16th Floor, Sacramento, CA 95814, 916-554-5950. Periodicals postage paid at Sacramento, Calif. Postmaster: Send address changes to *Journal of the California Dental Association*, P.O. Box 13749, Sacramento, CA 95853.

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Library Crossroad

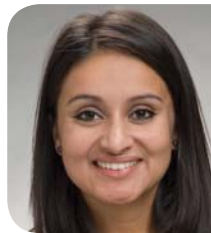
BY RUCHI K. SAHOTA, DDS, ASSOCIATE EDITOR

My brother teases me about my Facebook posts. “You’re still such a nerd.” When others post baby pictures, links to interesting news articles and other musings, I post about books ... and my beloved local Fremont library.

We went every Wednesday. My mother let us go free in the children’s section. We looked forward to getting home and starting on our bag of books each week. We had fun when we were kids. We rode our bikes to the park every day; we took over Chuck E. Cheese’s often; and we enjoyed lots and lots of ice cream. But nothing replaced the thrill of going to the library and picking out a new stack of books.

According to the American Library Association, Americans go to school, public and academic libraries 50 percent more often than they go to the movies. They say “without reading, everything in life is harder.” Crime, poverty and even poor health have been linked to low literacy in communities.

Twelve years ago, my city stopped funding my library’s Sunday hours. Libraries have been closing their doors or decreasing their hours around the state. Earlier this year, we started advocating for the restoration of our Sunday hours. In this economy, every non-working-time library hour is priceless. Our library provides strong homework help, local history artifact collection, and meeting rooms that hold community-gathering events. These resources are definitely not underutilized, but are they underappreciated by those who make the funding choices?



These resources are definitely not underutilized, but are they underappreciated by those who make the funding choices?

Another library was also at the crossroads for funding choices last year.

My first trip to the American Dental Association’s library in Chicago was during a girls’ trip — many, many years ago. I wanted to see the antique ivory dental instruments on display, the nineteenth century foot-powered drill I had seen in black and white photos, and of course G.V. Black’s original histological slides and books. And so I dragged my three best friends from college up to the sixth floor at the ADA building on the corner of Michigan and Chicago Avenues. We did not have an appointment. We walked right in and were immediately shown to the display case by one of the professional librarians. It was a memorable moment in my dental story. And being the daughter of a dentist, I grew excited to know that I could, one day, bring my children to experience these pieces of dental history as well.

But that will no longer be possible at the ADA library. As of last October, the ADA’s House of Delegates voted to allow the Board of Trustees to cut funding for the library on Chicago Avenue. Walk-in services for the ADA library have been discontinued. Those hallowed historical materials that I was so thrilled to hold in my hands

will no longer be housed in the ADA building. The Board explains, “As methods of research and library use continue to evolve [globally] ... library services will be narrowed in scope to those services that are most used and most impactful.” The ADA Board and staff have not determined where the extensive collection will be transferred. The National Dental Museum in Baltimore is almost bankrupt and the Smithsonian may not have room or relevance in our profession’s relics.

Libraries do not just hold books. Libraries store knowledge. They preserve this knowledge for those who come after us. They level the playing field. Libraries provide of our imaginations an opportunity to be inspired. And they are financially efficient. One roof, and in the case of the ADA, one room, house oodles of information and can serve so many. And though, historically speaking, luminaries such as Andrew Carnegie and Bill Gates have been staunch supporters of library systems, current support seems to be dwindling.

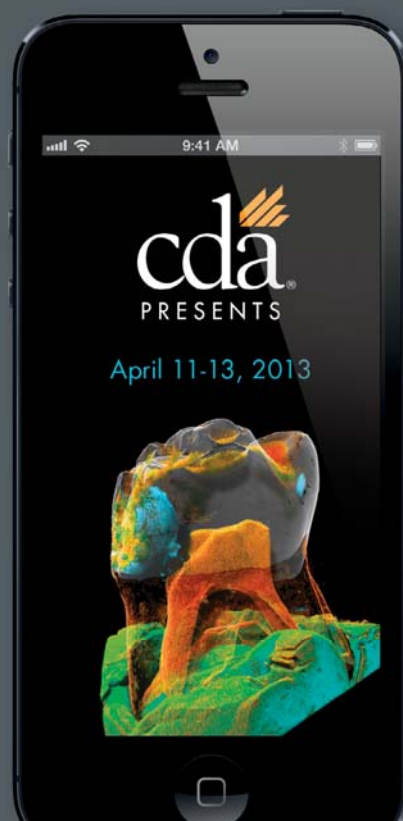
Libraries and librarians cannot live on love alone. Only a portion of our profession’s national library’s budget has been cut — thus far. Hopefully, the ADA will find a worthy home for

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our profession's historical artifacts. And hopefully the remainder of the Chicago Avenue's library resources and knowledge will be preserved. Malcolm Forbes said, "The richest person in the world ... couldn't provide you with anything like the endless, incredible loot available at ... [the] library." ■■■■

The Journal of the California Dental Association welcomes letters.

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When it Comes to Scrap Refining, Scientific Metals Strikes Gold

by Dr. William "Woody" Oakes



Author's Bio

Dr. William "Woody" Oakes

has been named one of the "Giants of Dentistry" and one of the "Top Clinicians in CE" by Dentistry Today magazine. Woody is the founder and editor of The Profitable Dentist

Dental scrap refining has always been a matter of trust with a hint of skepticism from the dentist vantage point. You were to a large degree at the mercy of the refining company. Even if your gut told you the reimbursement check was low, making your case that the jar of dirty scrap was worth more was an uphill battle to say the least. For years, this was a reality that just had to be accepted and the prevailing wisdom was that the scrap money was sort of "free money" and yes, the system for getting an accurate value was not perfect, but what else were you going to do to get value from old extracted crowns and bridges? I think the dental industry has been waiting for a player in the industry to emerge that could change this "reality". And recently, some interesting feedback from colleagues indicate the tide may be turning with respect to dental scrap refining.

My friend and colleague Dr. Craig Callen recently wrote to me and said "Dear Woody, I sent in a batch of old crowns to Scientific Metals and was amazed at the price and report I received. They are paying me five times what I ever was paid before. I wanted to thank you for the lead and reassure the readers that this is real deal." And then another colleague, Dr. Marc Barnett, wrote that he too had just received more than double for his scrap from Scientific Metals than he was getting. And then another email I read from Dr. Yamashiro to Scientific Metals read "Thank you and your company for great service, will tell my friends of your ethical company. You are great people". Throughout my entire career, I don't think I have ever heard a colleague tell a refining company that they were "great people". These emails really had me wondering about the dental scrap industry and in particular what Scientific Metals was doing differently that compelled random dentists in disparate parts of the country to take time to send unsolicited emails about their positive experiences.

Increased metal prices and different alloy compositions couldn't have been the deciding factor because these dentists were not comparing their recent scrap returns to scrap returns from ten years earlier, but rather to other recent scrap returns with similar metal prices. There had to be something else less random and more tangible. Now of course, it could have been simply a matter of trust and integrity in the reporting, but that too could only explain so much. I am sure there are other honest and reliable players in the industry other than the folks at Scientific Metals. The answer I found was rooted in Scientific Metals' business model and organizational structure.

The company employs no sales reps, either salaried or commission based. This means tremendous cost savings for the company which in turn appears to explain the higher and more accurate reimbursements to dentists. Now, don't get me wrong, many dental products demand and justify a reliable and knowledgeable sales rep for technical and customer support, etc. – many pieces of equipment and software immediately come to mind. But dental scrap refining is not one of these. The scrap has a finite and known value and it is your job to get a reimbursement that best captures this known value, especially in these tough economic times. In many cases, the benefits of a sales rep warrant higher costs. However, the evidence here strongly suggests this is not the case when it comes to dental scrap refining.

So why potentially forfeit a piece of your scrap return when you don't have to anymore? ■

For more information about Scientific Metals, please call 888-949-0008 or visit www.scientificmetals.com.

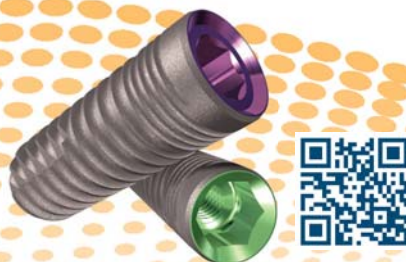
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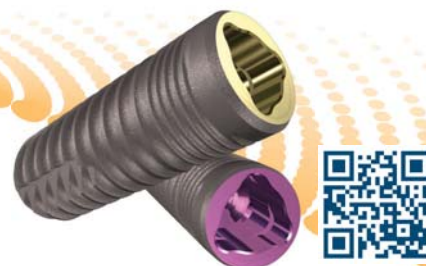
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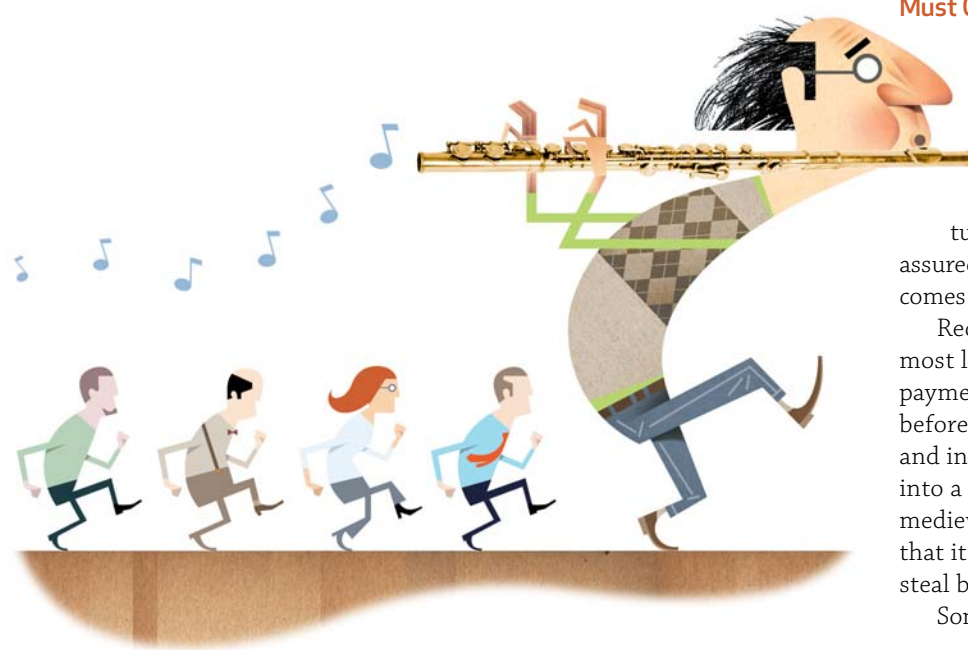
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Must Others Play By My Rules?

BY DAVID W. CHAMBERS, PHD

Aesop has the fable of the farmer and the snake, and there is a parallel tale of a turtle or frog and the scorpion or snake. The basic idea is that the farmer, turtle or frog gets a bite after being assured that there will be no bad outcomes from cooperation.

Recidivism is rampant. The patient most likely to no-show or skip on payments is the one who has done so before. The alcoholic is often a skillful and incorrigible liar, and those forced into a corner are usually dangerous. The medieval canon lawyer Grotius argued that it is ethical that those in great need steal because that is "natural."

Something does not seem quite right

CONTINUES ON 81

Origin of Teeth Older Than Believed

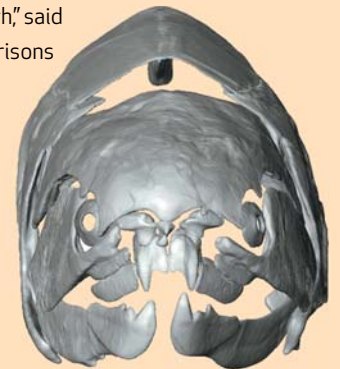
All living jawed vertebrates have teeth, but historically it has been believed that the first jawed vertebrates lacked teeth and instead caught and ate their prey with scissor-like jaw bones. New research, led by the University of Bristol, has found that the earliest jawed vertebrates possessed teeth too, indicating that teeth evolved simultaneously with, or soon after, the evolution of jaws, according to a news release from the university.

An international team of paleontologists and physicists studied fossils of a primitive jawed fish, *Compagopiscis*, using high energy X-rays to reveal the structure and development of its teeth and bones.

"We were able to visualize every tissue, cell and growth line within the bony jaws, allowing us to study the development of the jaws and teeth," said lead author, Martin Ruecklin. "We could then make comparisons with the embryology of living vertebrates, thus demonstrating that placoderms possessed teeth."

"This is solid evidence for the presence of teeth in these first jawed vertebrates and solves the debate on the origin of teeth," added co-author, Philip Donoghue of the University of Bristol's School of Earth Sciences.

For more information, see bristol.ac.uk/news/2012/8854.html.



Front view of a virtual model of the placoderm *Dunkleosteus*. Image by CT-scan courtesy of Phil Anderson, University of Massachusetts Amherst; Michael Ryan and Eric Snively, Cleveland Museum of Natural History; Model and images: Martin Rücklin, University of Bristol.

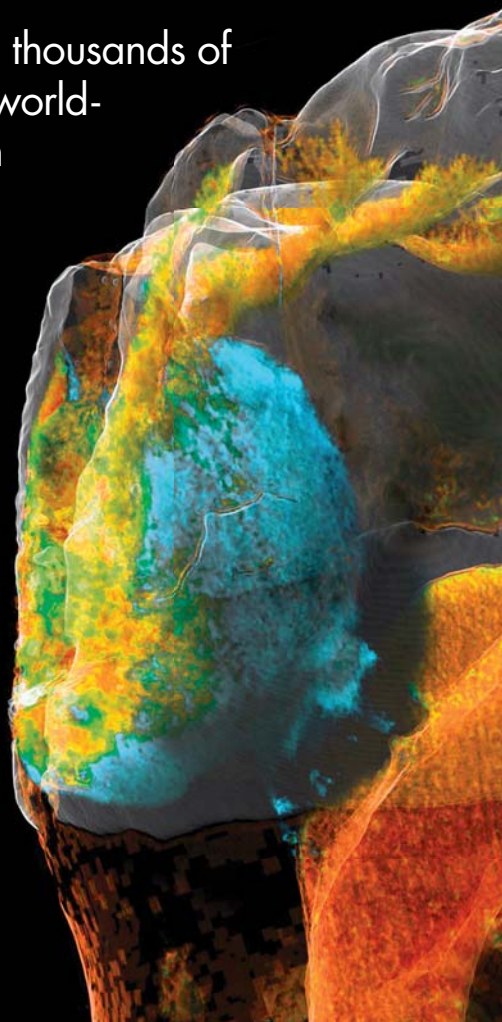
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New International Symposia feature four lectures with Japanese Drs. Minami and Watanabe as they delve into restorative techniques and materials currently used in Japan.



“At one end is a molecule that can bond with the graphene, and at the other is a molecule that bonds with bacteria, allowing the sensor to register its presence.”

MICHAEL MCALPINE

‘Tooth Tattoo’ Measures Bacteria in the Mouth

A new device being called a tiny “tooth tattoo,” developed by Princeton University scientist Michael McAlpine and Tufts University bioengineers Fiorenzo Omenetto, David Kaplan and Hu Tao, can measure the levels of bacteria in the mouth.

The ultra-thin oral sensor attaches temporarily to a tooth and has the potential to be a tool used regularly by dentists to assess their patients’ oral as well as overall health and shape their treatment plans accordingly.

Made of just three layers, the tiny device consists of a sheet of gold foil electrodes, an atom-thick layer of graphene and a layer of specially engineered structures called peptides that “sense” bacteria by binding to parts of their cell membranes.

“We created a new type of peptide that can serve as an intermediary between bacteria and the sensor,” said McAlpine in a Tufts University news story. “At one end is a molecule that can bond with the gra-

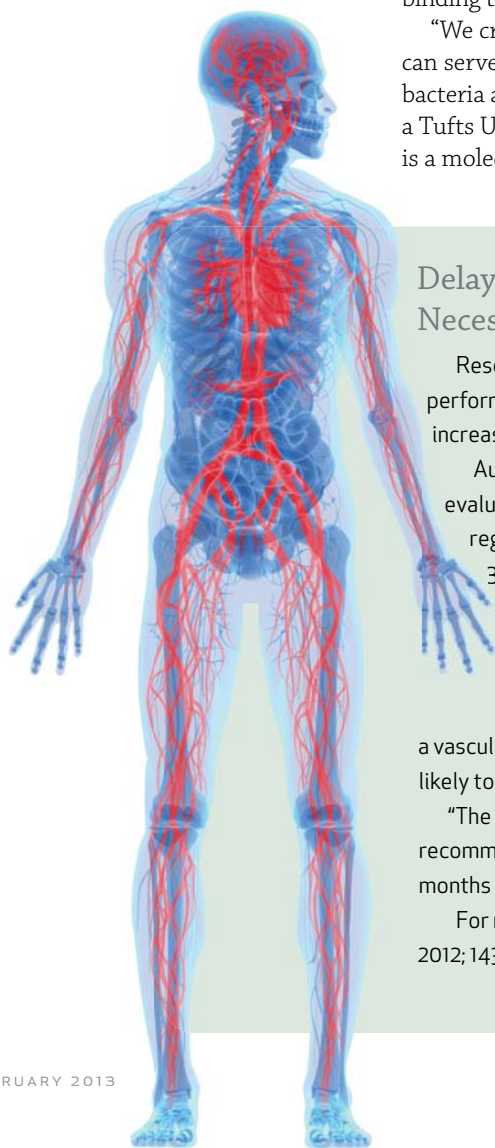
phene, and at the other is a molecule that bonds with bacteria, allowing the sensor to register its presence.”

Because the layers of the device are so thin and fragile, they required a tough but flexible backing in order to transfer them to a tooth. The team found silk does the trick.

By manipulating the proteins that make up a single strand, it’s possible to create silk structures in almost any shape, according to Omenetto. Once the sensor is placed on the tooth, the silk dissolves and the wirelessly powered sensor remains in place.

Without batteries, it requires being read and powered simultaneously through a built-in antenna. Using a custom-made handheld device, researchers can “ping” the antenna with radio waves, causing it to resonate electronically and send back information that the device then uses to determine if bacteria are present.

For more information, see *Nature Communications* 3, article 763 or now.tufts.edu/articles/tooth-tattoo.



Delaying Dental Treatment After Vascular Event Not Necessary

Researchers at the University of Minnesota have found that dental procedures, performed 30 to 180 days after an ischemic vascular event, were not associated with an increased risk of experiencing a second vascular event.

Authors of the study, published in the *Journal of the American Dental Association*, evaluated data of 50,329 Medicare beneficiaries, using Cox proportional hazards regression to study “associations between dental procedures performed within 30, 60, 90 or 180 days after a first event and the risk of experiencing a second vascular event,” authors wrote. Most hazard ratios associated with dental procedures were less than 1.0, although none differed significantly from 1.0, according to the study.

Their findings showed participants who received dental treatment soon after a vascular event, including those that produce a bacteremia consistently, were no more likely to have a second vascular event than those who delayed dental treatment.

“The results of this study suggest that clinicians should reassess historical recommendations that dental care in this population be postponed for as long as six months after an ischemic vascular event,” authors concluded.

For more information, see the *Journal of the American Dental Association* November, 2012; 143(11): 1190-1198 or jada.ada.org/content/143/11/1190.

Fear of the Dentist Passed on to Children by Their Parents

A recent study found that a parent who fears the dentist may pass that fear on to family members. Published in the *International Journal of Paediatric Dentistry*, findings from the study confirm that the higher the level of dentist fear or anxiety in one family member, the higher the level in the rest of the family.

"Along with the presence of emotional transmission of dentist fear amongst family members, we have identified the relevant role that fathers play in transmission of this phobia in comparison to the mother," said América Lara Sacido, one of the study authors.

The study evaluated 183 children between ages 7 and 12 and their parents in the Autonomous Community of Madrid and found that fathers play a key role in the transmission of dentist fear to children as well.

"Although the results should be interpreted with due caution, children seem to mainly pay attention to the emotional reactions of the fathers when deciding if situations at the dentist are potentially stressful," Lara Sacido said.

The study, according to the authors, shows the need to involve both mothers and fathers to prevent children's

dentist fear and the need for fathers to regularly visit the dentist and display no signs of fear or anxiety.

"With regard to assistance in the dental clinic, the work with parents is key," Lara Sacido said. "They should appear relaxed as a way of directly ensuring that the child is relaxed too."

For more information, see *International Journal of Paediatric Dentistry*, 2012; 22:324-330.



RULES, CONTINUED FROM 77

about this picture, however. Doesn't being moral mean exactly doing what is right, rising to a higher nature, especially when one has given one's word? Perhaps not.

Consider the case of lying. Odysseus was hugely admired in the Hellenistic world, especially because he told clever lies. Jacob cheated his father-in-law out of more than half his flock of sheep and the story is told approvingly in the book of Genesis. Virtually all cultures have a double standard regarding misleading those who are one's buddies and those in the out group.

There is much more at stake here than hair-splitting about how many fibs can dance on the head of a pin. It would be very convenient if everyone always did what he or she promised. Since we don't, our reflex response is to condemn the deceivers as unethical and leave it at that. They are not playing by the rules we wish to impose on them. If we can't have things our own way, at least we can be judgmental.

The alternative is to deal with our own circumstances and dreams and those of others on an equal and realistic footing. This requires a higher level of interpersonal empathy and greater moral skill, and it leads to a more flourishing sense of community than does the naïve approach of expecting that others will follow our personal ethical standards.

The wonderful thing about acting on an understanding of our own and others' interests and capabilities is that the joint best solution is self-enforcing. We do not need an outside authority to punish snakes that bite despite promising not to when we give them an appropriately wide berth. Gangs will not stop violence because it is against the law and the poor will not come to the dentist because we value good oral health. In every case, we must change the conditions on the ground rather than our opinions about them.



As the Scottish philosopher David Hume observed: "Nature is too strong for principle."

The nub:

- ① Expect people to do what it is their nature to do, including oneself.
- ② Understand others before imposing personal standards of right or wrong on them.
- ③ Change behavior by altering the way natural interests are expressed rather than through judgment.

David W. Chambers, PhD, is professor of dental education, Arthur A. Dugoni School of Dentistry, San Francisco, and editor of the *Journal of the American College of Dentists*.

FDA Assessment: Blood Thinner Pradaxa No Higher Bleeding Rates Than Warfarin

The bleeding rates associated with use of the anticoagulant dabigatran, Pradaxa, do not appear to be higher than bleeding rates associated with use of warfarin, according to a safety review by the U.S. Food and Drug Administration.

The FDA last year began evaluating post-marketing reports of serious bleeding events in patients taking Pradaxa. The assessment was done using insurance claims and administrative data from the Mini-Sentinel pilot of the Sentinel Initiative, a project sponsored by the FDA to create an active surveillance system to monitor the safety of FDA-regulated medical products.

Serious bleeding is “a well-recognized complication of all anticoagulant thera-

pies,” according to the FDA, which has not changed its recommendations regarding Pradaxa, saying on its website that Pradaxa provides an important health benefit when used as directed.

“It is important for dentists to conduct a thorough medical history and update it regularly,” said Daniel Meyer, senior vice president of Science/Professional Affairs, ADA Division of Science, in an ADA news story. “Part of the medical history is to determine if patients are taking any medications which might influence or have an effect on their oral health and/or medical care. When issues, concerns or questions arise dentists should consult with the patient’s primary care health care provider or specialist prior to providing definitive care.”

The FDA said in its assessment that it is continuing to evaluate multiple sources of data in the ongoing safety review of this issue.

For more information, see fda.gov or ada.org/news/7935.aspx.

Obesity and Dental Health in Homeless Children

A recent study was conducted to measure the relationship between body mass index and caries in homeless children. According to nurse researchers from Case Western Reserve University and the University of Akron, the study found that obesity and dental caries increase and become epidemic as children living below the poverty level age.

“It’s the leading cause of chronic infections in children,” said Marguerite DiMarco, associate professor at the Frances Payne Bolton School of Nursing at Case Western Reserve University.

The study examined the physicals of 157 children, from 2 to 17 years old, at an urban homeless shelter. Obesity was calculated based on height and weight or BMI, and cavity counts included missing, filled or injured teeth, according to the report.

Researchers reported that as BMI increased, so did caries. In addition, homeless children had higher BMI

and caries rates than the national averages. This is consistent with reports from the Centers for Disease Control and Prevention.

“Although a definitive conclusion between obesity and dental caries cannot be drawn, these two health issues are important areas for all pediatric health care providers to address at every visit,” authors wrote.

For more information, see [pedhc.org/article/S0891-5245\(11\)00411-1](http://pedhc.org/article/S0891-5245(11)00411-1) or blog.case.edu/think/2012/11/13/research_strengthens_link_between_obesity_and_dental_health_in_homeless_children.



Study: Gene Therapy in Human Salivary Glands Shows Great Potential

Scientists at the National Institute of Dental and Craniofacial Research, part of the National Institutes of Health, found gene therapy can be safely performed in the human salivary gland.

Salivary glands present an ideal target for gene therapy as they are easily accessible and, once a gene is introduced, it has no clear route to the bloodstream, where it could have unintended consequences.

Results from the clinical study showed that the transferred gene, Aquaporin-1, has great potential to help head and neck cancer survivors who suffer from chronic dry mouth, according to a news release from NIDCR. Just as salivary gland cells secrete saliva into the mouth, Aquaporin-1 encodes a protein that naturally forms pore-like water channels in the membranes of cells to help move fluid.

The scientists gave 11 head and neck cancer survivors a single-dose injection of the Aquaporin-1 gene directly into one of their two parotid salivary glands and found that five participants had increased levels of saliva secretion,



as well as a renewed sense of moisture and lubrication in their mouths, within the study's first 42 days, the period covered in the report.

"AdhAQPI vector delivery to a single parotid gland was safe and transfer of the hAQPI cDNA increased parotid flow and relieved symptoms in a subset of subjects," the authors wrote.

For more information, see pnas.org/content/early/2012/10/31/1210662109.

Genetic Basis Found for Birth Defects in Heart, Facial Muscles

Researchers recently outlined for the first time connections in genetic regulation that usually prevent heart and facial muscle birth defects. The authors' basic research will ultimately guide scientists to grow the cell types needed to repair such defects, from stem cells that can be generated from a person's own body.

"Once we understand these genetic controls in sufficient detail, we can not only turn a skin cell into a stem cell, but also turn that stem cell into the type needed for the patient to recover," said Chrissa Kioussi, co-author on the study and associate professor in the College of Pharmacy at Oregon State University. "We may eventually be able to grow replacement organs from the patient's cells."

In the study, published online in the *Proceedings of the National Academy of*

Sciences, researchers identified four specific "transcription factor" genes that control processes related to muscle formation of the heart and head. The process moves quickly after conception — within one month, most cell types in the body are already "known." When defects exist in the process, the result can be death or a number of problems, including cleft palate and facial malformations.

"If you know all the steps it takes to get from here to there, you can identify what went wrong and find ways to fix it. This is being done already with some disease problems, and this work will move us closer to being able to repair heart and craniofacial defects," said Kioussi.

For more information, see pnas.org/content/109/46/18839 or oregonstate.edu/ua/ncs/archives/2012/oct/researchers-identify-genetic-basis-cardiac-craniofacial-birth-defects.



Vitamin D May Lower Risk of Tooth Decay in Children

A recent review of clinical trials that included children from several countries found a possible role for vitamin D in the prevention of tooth decay.

The review, conducted by Philippe Hujoel, DDS, MSD, MS, PhD, of the University of Washington, utilized 24 controlled clinical trials from the 1920s through the 1980s on roughly 3,000 children in multiple countries, according to a news release from the university. Results of the review showed vitamin D was associated with nearly a 50 percent reduction in the incidence of tooth decay.

Vitamin D's role in supporting bone health has not been disputed, but significant disagreement has existed over its role in preventing cavities. The American Medical Association and the U.S. National Research Council concluded around 1950 that vitamin D was beneficial in managing dental caries. Based on the same evidence, the ADA disagreed. In 1989, the National Research Council, despite new evidence

supporting vitamin D's caries-fighting benefits, called the issue "unresolved."

"Such inconsistent conclusions by different organizations do not make much sense from an evidence-based perspective," Hujoel said.

Vitamin D levels in many populations are decreasing while dental caries levels in young children continue to rise.

"Whether this is more than just a coincidence is open to debate," Hujoel said. "In the meantime, pregnant women or young mothers can do little harm by realizing that vitamin D is essential to their offspring's health. Vitamin D does lead to teeth and bones that are better mineralized."

Hujoel cautioned: "One has to be careful with the interpretation of this systematic review. The trials had weaknesses which could have biased the result, and most of the trial participants lived in an era that differs profoundly from today's environment."

For more information, see eurekalert.org/pub_releases/2012-11/uow-nra112712.php.



UPCOMING MEETINGS

2013

Feb. 7-9	20th anniversary Conference and Exhibition, Academy of Laser Dentistry, Palm Springs, laserdentistry.org
April 7-13	U.S. Dental Tennis Association, TOPS'L Resort, Destin, Fla., 800-445-2524 or dentaltennis.org
April 11-13	CDA Presents The Art and Science of Dentistry, Anaheim, 800-CDA-SMILE (232-7645), cdapresents.com
Aug. 15-17	CDA Presents The Art and Science of Dentistry, San Francisco, 800-CDA-SMILE (232-7645), cdapresents.com
Oct. 31-Nov. 5	154th ADA Annual Session, New Orleans, ada.org/session
Nov. 3-9	U.S. Dental Tennis Association, Big Island, Hawaii, 800-445-2524 or dentaltennis.org

To have an event included on this list of nonprofit association continuing education meetings, please email Courtney Grant at courtney.grant@cda.org.



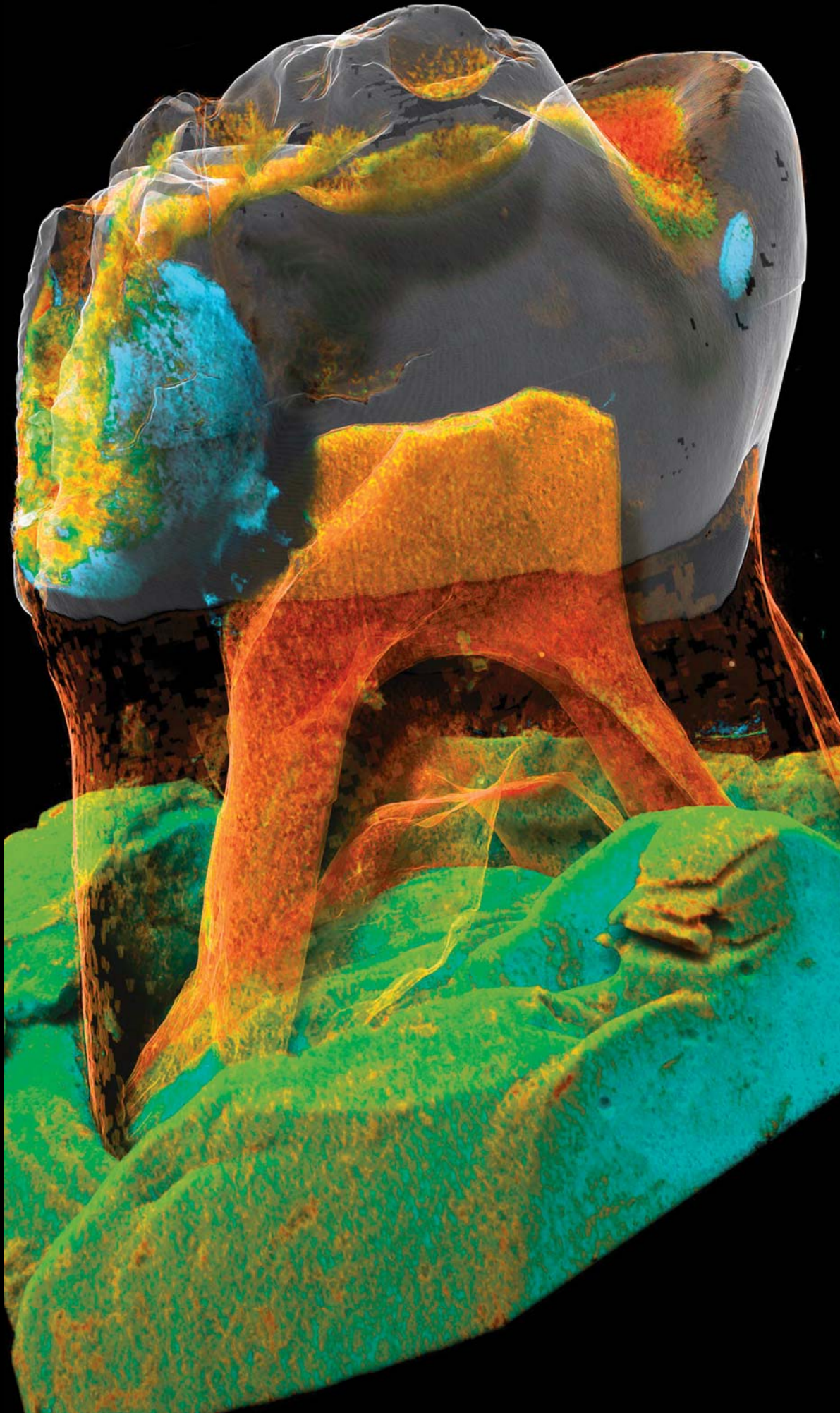
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of Dentistry

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Anaheim
California

Thursday—
Saturday
April 11–13
2013

cdapresents.com



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Programs for Dentists



Frank T. Curry, DDS (moderator)
Stephen J. Chu, DMD, MSD, CDT
Kenneth A. Malament, DDS
Terry T. Tanaka, DDS
Dennis P. Tarnow, DDS

Decisions Panel

Friday afternoon lecture



Kenneth A. Malament, DDS
Dental Materials and Application
Saturday lecture



M. Nader Sharifi, DDS, MS
Prosthodontics/Removable
Thursday morning lecture
Thursday afternoon workshop
Friday morning lecture
Friday afternoon workshop



Dennis P. Tarnow, DDS
Implant Dentistry
Friday morning lecture



DeWitt C. Wilkerson, DMD
Occlusion
Thursday lecture
Friday workshop



Corky Willhite, DDS, FAGD
Esthetic Dentistry
Thursday workshop
Friday lecture



David A. Garber, DMD
Crowns and Bridges
Saturday morning lecture

International Symposia

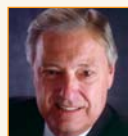


Kiyokazu Minami, DDS
Restorative Dentistry
Thursday lecture



Takashi Watanabe, DDS
Restorative Dentistry
Saturday lecture

Programs for Office Staff



Joseph A. Blaes, DDS
Dental Assistants Program
Friday lecture



Charles Blair, DDS
Finance
Saturday lecture



Lisa F. Harper-Mallonee, BSDH, MPH, RD, LD
Nutrition
Thursday lecture
Friday lecture



Kelli S. Vrla, CSP, BBA, BA
Leadership and Staff Engagement
Thursday lecture
Friday lecture



Victoria L. Wallace, CDA, RDA, LDA
Dental Assistants Program
Thursday lecture
Friday workshop
Saturday workshop

\$10 reserves your seat in these popular lectures

Have you ever shown up on time or even early to a popular lecture only to find that it was already full? To alleviate that frustration, the following courses have been selected to designate a portion of the capacity as reserved seating. This opportunity is optional and only available in advance for the following lectures at cdapresents.com. Beyond these reserved seating options, all lectures remain free on a first-come, first-served basis.

Details

- Seats will be held up to 15 minutes after the program begins, after which time seats will be released if the room is full.
- A separate entrance will be available for reserved seating ticket holders.
- Ticket must be presented and is nonrefundable if lost, stolen or forgotten.
- Reserved seating is grouped together in a designated section so we can provide better service.



Thursday, April 11

Lisa F. Harper-Mallonee, BSDH, MPH, RD, LD
Healthy Mouth, Healthy Body — Healthy Practice! (a.m.)
Event # 051

Lisa F. Harper-Mallonee, BSDH, MPH, RD, LD
Probiotics, Supplements and Food Fads: Considerations for the Dental Professional (p.m.)
Event # 052

DeWitt C. Wilkerson, DMD
The ABCs of Dental Occlusion and Occlusal Equilibration (full day)
Event # 053

Friday, April 12

Dennis P. Tarnow, DDS
Immediate vs. Delayed Socket Placement: What We Know, What We Think We Know and What We Don't Know (a.m.)
Event # 054

Gregory L. Psaltis, DDS
Baby Steps — Infant and Preschool Dental Care for the General Practitioner (p.m.)
Event # 055

Saturday, April 13

Kenneth A. Malament, DDS
Integration of Esthetic Dentistry in Routine and Complex Prosthodontics
Event # 056 (a.m.)
or # 057 (p.m.) (Repeat lecture)

Raymond L. Bertolotti, DDS
Adhesion, Not Tooth Destruction (full day)
Event # 058



135,000 square feet of dental innovation

With more than a hundred new product launches and nearly 600 exhibitors filling the vibrant exhibit hall, *CDA Presents* is one of the most anticipated dental tradeshow in the U.S. It's the place to discover the latest innovations in dentistry.

Grand Opening

Thursday, April 11, 9:30 a.m.

Exhibit Hall Hours

Thursday, April 11, 9:30 a.m.–5:30 p.m.

Friday, April 12, 9:30 a.m.–5:30 p.m.

Saturday, April 13, 9:30 a.m.–4:30 p.m.

Family Hours

Daily: 9:30 a.m.–noon



While dentistry in the U.S. is breaking new ground, the same can be said for alternative philosophies and treatment modalities the world over. Join Drs. Minami and Watanabe in a spirit of international camaraderie as they delve into restorative techniques and materials currently used by dentists in Japan.

The International Symposia consist of four lectures with live English interpretation via headphones.





Saturday

- 10–11 a.m. Office Policies and Procedures/Do You Have Them? (C.E.: 20% – 1.0)
Robyn Thomason
- 11 a.m.–noon. Handling Refund Requests From Insurance Plans (C.E.: 20% – 1.0)
Patti Cheesebrough
- Noon–1 p.m. Patient Records — Access and Rules (C.E.: 20% – 1.0)
Teresa Pichay

Reference On-Site Show Guide for updated program information.

The Spot Educational Theater Schedule

It's the spot for free Wi-Fi as well as a charging station. It's the spot for C.E. and the Smart Dentist Series of free one-hour lectures. And, it's a spot to relax and catch your breath after a hectic day on the exhibit hall floor. It's The Spot, where something's happening every day.

Thursday

- 10–11 a.m. Office Policies and Procedures — Do You Have Them? (C.E.: 20% – 1.0)
Robyn Thomason
- 11 a.m.–noon Handling Refund Requests From Insurance Plans (C.E.: 20% – 1.0)
Patti Cheesebrough
- Noon–1 p.m. Dealing With Patients Who Won't Pay Their Bill? (C.E.: 20% – 1.0)
Katie Fornelli
- 1–2 p.m. Dental Insurance Coding for Success: What Every Office Should Know About the NEW CDT Codes (C.E.: 20% – 1.0)
Gary L. Dougan, DDS, MPH
- 2–3 p.m. Characteristics of Ethical Dental Professionals (C.E.: 20% – 1.0)
Brooke Kozak

Friday

- 10–11 a.m. Dental Insurance Coding for Success: What Every Office Should Know About the NEW CDT Codes (C.E.: 20% – 1.0)
Gary L. Dougan, DDS, MPH
- 11 a.m.–noon Addressing Negative Online Reviews (C.E.: non-eligible)
Carla Christensen
- Noon–1 p.m. Managing Patient Conflicts (C.E.: 20% – 1.0)
Brooke Kozak
- 1–2 p.m. Preparing Your Office Emergency Kit (C.E.: Core – 1.0)
Steven I. Ganzberg, DMD
- 4–5:30 p.m. Wine Seminar (Ticket Required)

Wine Seminar

Wine FUNdamentals

Join us for an interactive wine experience and learn while you taste! Do you prefer fruity and juicy wines or earthy and subtle? Wines with big tannins or tannins that are more velvety? Come join us as we taste through wines from both the Old World (more earthy) and the New (more fruity). Learn what your palate preference is by tasting wines from France, Italy, Spain, Australia, New Zealand and California!

Date/Time: Friday, April 12, 4–5:30 p.m.

Location: The Spot

Fee: \$30

Event #: 046



Register online today: cdapresents.com

Here is some information you will be asked for when registering:

- Name
- Address
- Phone number
- Registration type
- License number (if applicable)
- Emergency contact person
- Ticketed courses/events to purchase
- Password
- Email address (used for username and instant confirmation)

Leave your worries at home and choose to pick up your materials on site at eBadge Exchange! This option gives you the ability to make any necessary changes to your registration from your personal online dashboard at any time until March 13. Otherwise, register by February 13 to have materials mailed to you at least two weeks prior to the meeting. Remember, CDA dues must be current for 2013 to complete your registration as a member.

Please note: Registrations are not accepted over the phone.

On-site registration/bag and lanyard pickup

Anaheim Convention Center

Thursday	6:30 a.m. – 5:30 p.m.
Friday	6:30 a.m. – 5:30 p.m.
Saturday	6:30 a.m. – 4:30 p.m.

Bags and lanyards will also be available at the Hilton Anaheim Hotel

Thursday	7 a.m. – 3 p.m.
Friday	7 a.m. – 3 p.m.
Saturday	8 a.m. – noon

What is the cost for CDA dentists?

Zero. As a benefit of membership, the \$890 registration fee is waived for CDA dentists.

Staff and guests

Dentists may register staff and guests, but not other dentists. All dentists, including nonmembers must register as dentists. Staff and guest fees can be found at cdapresents.com.

If you register an employee who is no longer attending, you can exchange the badge on site for a new one at no charge.

One-time \$75 California nonmember rate*

Nonmembers can save \$815 with the \$75 one-time meeting registration fee.* If you were a CDA member in 2011 or 2012, you are not eligible for the one-time nonmember \$75 registration fee for 2013. Materials cannot be mailed in advance, but can be picked up at a required 20-minute membership presentation held in the registration area. You will receive an email approximately one month prior to the show with presentation time options for your convenience. If you are not able to attend one of the membership presentations, your registration cost will be \$890.

**Any nonmember who has taken advantage of this offer in the past is not eligible. The rate is for one-time promotional use only.*

Registration deadlines

Feb. 13, 2013: To have materials mailed prior to the show.

Feb. 14 – April 14, 2013: Online registration remains open and materials will be available at the eBadge Exchange booth at the Anaheim Convention Center.

CDA mails registration materials at least two weeks prior to the meeting. If you do not receive materials within this time frame, call CDA at 800.232.7645.

Cancellations and/or course changes can be made from your online registration dashboard or requested in writing until March 13, 2013. After this date, refunds will not be given. If badges and/or tickets have already been mailed, the appropriate materials must be returned with your refund request and postmarked by March 13 in order to be processed.

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Phone

714.765.8868

Office hours are 8:30 a.m.–5 p.m. Pacific Time.

Fax

714.776.2688

Mail

CDA Housing Bureau
800 W. Katella Ave.
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Anaheim, CA 92803

Online/New Reservations

Making reservations is easier than ever. Just log onto **cdapresents.com**, and you can make your hotel reservation. The online service has been upgraded to be more convenient and flexible in making and changing reservations. You may phone, fax, complete the online housing form, or write to make your reservations. Be sure to have a copy of the hotel reservation form and your credit card information on hand if you call, or complete the hotel reservation form and mail or fax to CDA's Housing Bureau. Please do not do both!

Reservation Acknowledgments

Acknowledgments will be sent to you directly from CDA's Housing Bureau.

Deposit/Cancellation Policy

Reservations will only be accepted with a credit card or company check payment. Company check must be made payable to requested hotel.

Reservations must be canceled before 5 p.m. Pacific Time on Friday, Feb. 22, 2013, to receive a full refund. Reservations canceled after 5 p.m. Pacific Time on Feb. 22, but before 5 p.m. Pacific Time on Friday, March 15, 2013, will be charged a \$35 processing fee per room. **Cancellations received after 5 p.m. Pacific Time on March 15, 2013, will forfeit their entire deposit.**

Be sure to include a return fax number or email address in case of questions or problems with the fax transmission. Make reservations as soon as possible through CDA's Housing Bureau, by March 15, 2013. After this date, reservations will be made on a space-available basis. **Do not mail or fax forms to CDA headquarters as this will delay your request.**

Changes, Cancellations, Refunds

All changes, cancellations and refund requests must be made in writing directly with CDA's Housing Bureau. This can be done by mail, fax or email (anaheimhousing@anaheimoc.org). An acknowledgment of your request will be sent to you once it has been completed. Refund and cancellation requests must be received prior to Feb. 22, 2013, for full refund of hotel deposit. **Reservations canceled after 5 p.m. Pacific Time, March 15, 2013, will forfeit their entire deposit.**

Hotel Reservation Form

Reservation Deadline: March 15, 2013

(After this date, reservations will be made on a space-available basis.)

ONLINE

Book online anytime at
cdapresents.com

MAIL TO

CDA Housing Bureau
800 W. Katella Ave.
P.O. Box 4270
Anaheim, CA 92803

PHONE

714.765.8868
Office hours are
8:30 a.m.–5 p.m. PT

FAX

714.776.2688

Name _____

Address _____

City _____ State _____ ZIP _____

Phone _____ Fax _____ Email _____

Name of person making the reservation _____

Please indicate how your hotel selection was made: Location _____ Rate _____

HOTEL PREFERENCE

1st choice _____	Rate _____
2nd choice _____	Rate _____
3rd choice _____	Rate _____

*ROOM TYPE

*Room types vary by hotel. Please call the housing bureau for details, including suite information and rates.

(1) Single	(1 person)
(2) Double	(2 people, 1 bed)
(3) Double/Double	(2 people, 2 beds)
(4) Triple	(3 people, 2 beds)
(5) Quad	(4 people, 2 beds)

NAMES OF OCCUPANTS

ARRIVAL

DEPARTURE

ROOM TYPE

*List corresponding # for room type

CREDIT CARD INFORMATION All rooms require a deposit in the amount of a night's lodging at the time of booking.

ADDITIONAL RESERVATION INFORMATION:

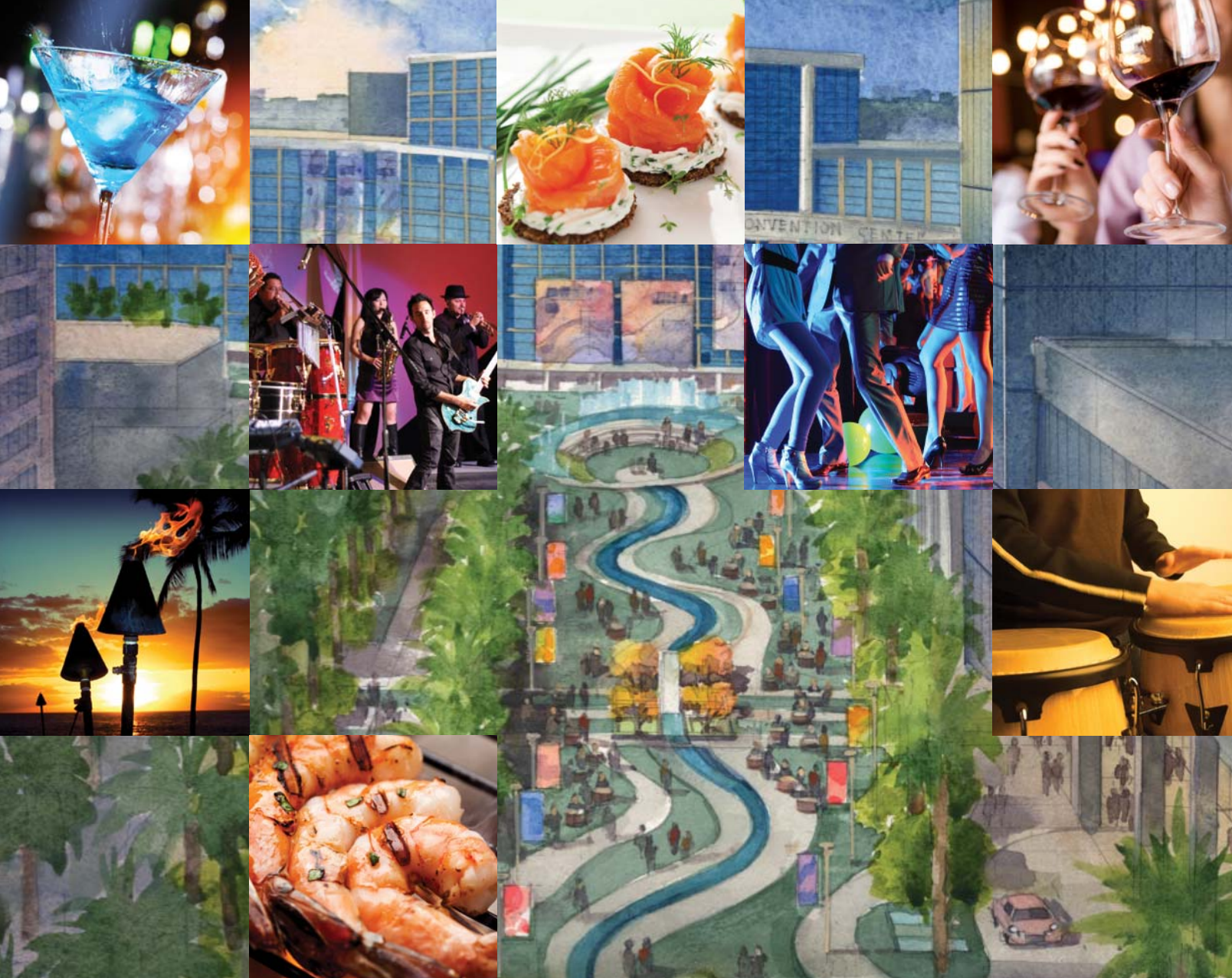
1. Reservations will not be processed without a first night's deposit.
2. If you are making more than one reservation, you will need to provide a credit card and billing address for each room.
3. Billing address should be provided if different than address on reservation.
4. Once a deposit has been posted to a reservation, it cannot be transferred to another reservation.
5. Each credit card must be valid through the reservation dates of the stay.
6. To pay by check, make check payable to requested hotel.
7. For fax or group reservations, you will receive a confirmation within five business days.

8. No refunds on room deposits will be given after March 15, 2013.

Credit card number _____ Exp. date _____

Signature _____ Print name as it appears on card _____

IMPORTANT – PLEASE READ: No refunds on room deposits will be given after March 15, 2013. If you do not receive a confirmation within five days, please call for assistance. Please note duplicate/double booking of reservation will result in "no show" charges on your credit card. **Deposit policy:** Reservations will only be accepted with a credit card or check payment. Reservations and changes are subject to hotel availability. **Cancellation policy:** All cancellations must be made in writing through the CDA Housing Bureau. Reservations must be canceled before 5 p.m. Pacific Time on Friday, Feb. 22, 2013, to receive a full refund. Reservations canceled after Feb. 22, but before 5 p.m. Pacific Time on Friday, March 15, 2013, will be charged a \$35 processing fee per room.



Party in the Plaza

The beautiful new Grand Plaza serves as the backdrop for CDA's Party in the Plaza. California casual yet outside the ordinary, you'll dine on mouth-watering delicacies, mingle with fellow attendees and boogie down with LA's hottest cover band, Shaken Not Stirred.

CDA's Party in the Plaza

Friday, April 12th, 7-10 p.m.

Event # 045 in the new Anaheim Grand Plaza

\$65 – Open to all registration types

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CDA's Party in the Plaza. It's the hottest ticket in town.

cda
PRESENTS



Salivary Diagnostics: The Enabling Factors for Detecting Oral Diseases

DAVID T. WONG, DMD, DMSC

GUEST EDITOR

David T. Wong, DMD, DMSC, is the associate dean of Research, a professor in the Division of Oral Biology and Medicine and the director of the Dental Research Institute, at the University of California, Los Angeles, School of Dentistry.

Conflict of Interest

Disclosure: David T. Wong, DMD, DMSc, is cofounder of RNameTRIX, a molecular diagnostic company.

Salivary diagnostics has taken a significant posture in dentistry based on its recent advancements in the basic, translational and clinical sciences. The National Institute of Dental and Craniofacial Research (NIDCR), academic communities, organized dentistry, payers and business development sectors are key stakeholders that have aligned in significant ways to enable this disruptive technology to improve access to care, reduce health disparities, accelerate treatment and diagnostic decisions and impact oral and global health.

In this issue of the *Journal of the California Dental Association*, we present key enabling factors that must be in alignment in order for salivary diagnostics to reach clinical maturation. These enabling factors are:

Salivary Collection Systems

The science of saliva collection, processing, stabilization and storage (SCPSS) represents a critical, upfront technology to saliva-based diagnostics. Lessons learned from research on biospecimens and

biorepositories show that differences in sample handling and processing will lead to outcomes that will not be comparable between studies and/or laboratory sites. Standardization and robustness of these upfront capabilities are therefore crucial. That said, what is surprising is the variety and diversity of saliva collection devices available, each tailored for specific applications. Paul Slowey, PhD, comprehensively surveys the field, identifies key issues and gaps, and presents solutions that address these issues from scientific, translational and clinical perspectives. These technologies will importantly impact the use of saliva for the detection of two of the most prevalent infectious diseases — dental caries and periodontal diseases.

Salivary Biomarkers for Caries Risk Assessment

Dental caries, an oral disease and one of the most prevalent infectious diseases, should be detectable in saliva with compelling performance. Wenyan Shi, PhD, and his colleague Lihong Guo, DDS, PhD, carefully review this field with

a specific focus toward elucidating the multifactorial nature of this complex infectious disease: bacterial, carbohydrate and host factors. Innovative research is ongoing and will significantly impact caries risk assessment and control.

Salivary Biomarkers for Periodontal Disease Detection

With as much as 80 percent of the adult population affected by periodontal diseases, the need for early detection technologies is imperative. While salivary

biomarkers are compelling constituents that should serve well in this capacity, there are no clinically validated salivary biomarkers for the detection of various periodontal diseases. In this article, Jeffrey Kim, DDS, PhD, Christine Kim and Paulo Camargo, DDS, MS, MBA, FACD, review the field and assess the role of salivary biomarker development for periodontal disease detection. They highlight the importance of integration of omics technologies in saliva for periodontal disease detection.

A New Industry

Jed Jacobson, DDS, MS, MPH, presents a unique perspective on why the dental profession should value salivary diagnostics and how it can impact our profession as well as the value for consumers. He presents visionary perspectives in the form of value propositions for the profession and consumers as to how this disruptive technology can enhance the dental profession including the advancement into primary health care. ■■■■



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*SOURCE: American Dental Association, Survey Center, 2010 Survey of Dental Practice. Adjusted gross income.

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Commercial Saliva Collections Tools

PAUL D. SLOWEY, PHD

ABSTRACT Saliva has been used as a specimen for diagnostics purposes for many years, but it has only been in the last 10 years that a number of new tools have been developed that promise to greatly increase the use of oral specimens for broad-based diagnosis and potentially screening applications. This article focuses on tools that are commercially viable or can play a role in whole saliva collection and future testing for critical diseases.

AUTHOR

Paul D. Slowey, PhD, is the CEO of Oasis Diagnostics Corporation in Vancouver, Wash. Slowey earned his BS in applied chemistry from Sheffield City Polytechnic, South Yorkshire, England. He earned his PhD in synthetic organic chemistry from the University of Newcastle, Newcastle upon Tyne, England.
Conflict of Interest
Disclosure: Paul D. Slowey, PhD is the CEO of Oasis Diagnostic Corporation.

In the literature, the word “saliva” has been used in literal fashion to describe secretions in the oral cavity; however, a number of different sub-components exist in saliva. Various terms may be used to describe fluids collected from the mouth, including the broad term saliva, oral fluids, gingival crevicular fluid and others. Below are brief definitions of the most important terms used when discussing salivary tools with potential diagnostic or investigative applications:

Saliva — a watery substance located in the mouth of organisms, secreted by three main salivary glands – the submandibular, the parotid and sublingual, as well as hundreds of other minor salivary glands and gingival crevicular fluid. Human saliva is composed of 95% water but also electrolytes, mucus, antibacterial compounds and enzymes. It performs many normal functions including food

digestion, lubrication, taste facilitation and bolus formation.

Oral fluids — this term is often used interchangeably with saliva and used frequently in forensic toxicology, particularly in the drug-testing world.

Gingival crevicular fluid — a fluid occurring in minute amounts in the gingival crevice, believed by some authorities to be an inflammatory exudate and by others to cleanse material from the crevice containing sticky plasma proteins, which improve adhesions of the epithelial attachment, have antimicrobial properties and exert antibody activity.¹

It is outside the scope of this manuscript to include a range of good and effective tools on the market that collect various sub-components of whole saliva for a range of research applications. Information on these types of devices has been reported elsewhere.^{2,3}



FIGURE 1: OraSure Oral Specimen Collection Device (OraSure Technologies)



FIGURE 2: Quantisal Oral Fluid Collection Device (Immunalysis Corporation)



FIGURE 3: Salivette (Sarstedt)

History

The early pioneers in the commercialization of salivary diagnostic tools were Epitepe, Inc. (Beaverton, Ore.) and Saliva Diagnostics Systems (Vancouver, Wash.). Each developed saliva collection devices that have proved to be possibly the most successful tools on the market today. Now called OraSure Technologies (Bethlehem, Pa., orasure.com), Epitepe, Inc. originally developed the OraSure Oral Specimen Collection Device (**FIGURE 1**) for general-purpose saliva collection, but broadened its use by “marrying” the device to test kits with specific applications in mind. The device consists of a cellulose pad material attached to a plastic stem. The pad material is used to rub the surfaces of the cheeks adjacent to the gumline for a period of time then left in the oral cavity between the teeth and gumline to absorb a salivary sample. OraSure describes this as “oral mucosal transudate.” The pad material is pretreated with proprietary salts that aid the collection process. Collection time is 2 - 5 minutes after which the device is placed into a collection tube containing a buffer and transported to a laboratory. Dilution of the collected sample in buffer requires a centrifugation step upon receipt prior to sample analysis.

The OraSure device was linked to an HIV-1 Enzyme Linked Immunosorbent Assay (ELISA) test from Organon Teknika (Boxtel, Netherlands), which eventually would become the first FDA-approved oral test for detection of the

HIV virus. Applications for the OraSure HIV-1 product include public health screening, surveillance, life insurance risk assessment and outreach programs.

The OraSure device is also used for substance abuse testing for the NIDA-5 (THC, cocaine, opiates, methamphetamines and PCP) and other abused drugs, under the brand name Intercept. This device has widespread application in forensic toxicology, workplace testing and criminal justice settings among others.

Now called StatSure Diagnostic Systems (New York, statsurediagnostics.com), Saliva Diagnostics Systems originally developed the Saliva-Sampler Collection Device, also trademarked in certain parts of the world as Omni-SAL, for standardized saliva collection. The Saliva-Sampler device was used for general-purpose saliva collection and received 510(k) approval from the FDA for such purposes but was never “paired” with any specific diagnostic or abused drug tests until the rights to the product were transferred to California-based Immunalysis Corporation (Pomona, Calif., immunalysis.com). Immunalysis rebranded the product as Quantisal and validated saliva collection to a series of ELISA-based drug tests assays, which have received FDA clearance and are subsequently sold for workplace testing, forensics, criminal justice and other applications.

The Quantisal Oral Fluid Collection Device (**FIGURE 2**) also uses a cellulosic material attached to a stem to harvest

saliva. An absorbent pad is placed in the mouth and saliva collected until a sample volume indicator built into the device changes color from white to blue (approximately 2 minutes) indicating sufficient saliva [1.0 mL + or - 10 percent) has been collected to perform any subsequent analysis. The absorbent pad has a series of perforations near the top of the cellulose pad, which allows easy detachment of the pad into a transportation tube containing a stabilizing buffer to ensure safe delivery of the sample to the laboratory for testing.

Another of the early saliva innovators was Sarstedt (Nümbrecht, Germany) which introduced the Salivette tool in 1987. Although Salivette has not received any approvals or clearances from the FDA, the collection system is widely used in the market for research applications ranging from detection of steroid hormones from saliva, HIV - antibody detection, markers of oxidative stress and others.

Salivettes (**FIGURE 3**) are available as cotton or polypropylene rolls/sponges, each with an associated transport tube. Salivette is placed in the mouth and chewed for approximately two minutes then placed into the transport tube for dispatch to a testing laboratory. The device does not incorporate any means of sample sufficiency and the specimen must be centrifuged prior to analysis.

The ORACOL collection kit (**FIGURE 4**) from Malvern Medical Developments (Worcester, U.K., malvernmedical.uk.com) utilizes an absorbent foam material



FIGURE 4: ORACOL Saliva Collection Kit (Malvern Medical)

in a swab format to collect up to 1 mL of saliva. The kit consists of an absorbent foam swab (designed to collect up to 1 mL of saliva), centrifuge tube and cap. Saliva is collected from the oral cavity by absorption then centrifuged in the tube provided. The processed specimen is typically used for infectious disease testing particularly measles, HIV, hepatitis A and B, mumps and rubella.

UltraSal-2 (**FIGURE 5**) is a large-volume saliva collection device featuring two distinct collection tubes that allows “split-sampling” from the same subject. The user expectorates into a mouthpiece connected to two 12 mL tubes and directs saliva into one or the other tube by rotating the device at the appropriate angles to allow sufficient saliva to be collected into each tube. UltraSal-2 is manufactured by International Diagnostic Systems (St Joseph, Mich.), a subsidiary of Neogen Corporation (Lexington, Ky., neogen.com) UltraSal-2 is used mainly for drug testing purposes.

Oasis Diagnostics Corporation (Vancouver, Wash., 4saliva.com) manufactures oral-based tools including Versi-SAL, a device for standardized saliva collection. Versi-SAL uses a non-cellulosic pad material to collect saliva from *under* the tongue. After approximately 1 to 2 minutes, sample sufficiency is indicated by the change in appearance of a sample volume adequacy indicator built into the device. Saliva is subsequently delivered into a standard 2 mL Eppendorf tube by expressing the sample through a plastic compression tube provided with the



FIGURE 5: UltraSal-2 Split Sample Saliva Collection Device (IDS/Neogen U.S.)

device. Various configurations of the device can provide between 0.5 and 1.0 mL of whole saliva, with the possibility of dual samples from the same patient. The Versi-SAL Oral Fluid Collection Device (**FIGURE 6**) is used for general-purpose saliva collection including steroid hormones for wellness testing, abused drug analysis, nicotine testing and others.

There are also a number of “specialized” collection tools for salivary hormone collection developed by manufacturers of microplate ELISA kits as “companion tools” for collection that are sold in conjunction with various test kits. Examples include DiaMetra (Milan, Italy, diametra.com), IBL (Hamburg, Germany, ibl-international.com), Salimetrics (State College, Pa., salimetrics.com) and others. Further, some “emerging” salivary collection tools that will “challenge” today’s market-leading products are discussed in the section entitled “What the Future Holds?”

Current Tools for Saliva Collection and Diagnosis

The early success of companies such as OraSure, StatSure, Sarstedt and others paved the way for a much broader array of salivary collection tools that are now available in two specific areas worthy of mention.

The first is in so-called “point-of-care” (POC) tests that marry the capability of standardized saliva collection with functional lateral flow immunochromatographic (LFT) test strips to deliver immediate results from



FIGURE 6: Versi-SAL Oral Fluid Collection Device (Oasis Diagnostics)

salivary samples. Areas that have seen the most growth include substance abuse detection and HIV diagnosis. While rapid POC saliva tests are definitely growing in significance, and certain tools have made a clear impact, point-of-care diagnosis using oral samples is still in the embryonic phase.

The other significant growth area for salivary diagnostics is in molecular diagnostics (nucleic acid testing, NAT), particularly PCR, genotyping, sequencing techniques, genome-wide association studies (GWAS) and other molecular techniques where it has been proven that salivary samples are equivalent in performance to blood sampling and are more cost-effective, convenient and simpler to use. This area of salivary diagnostics is one of the most rapidly expanding areas. Within this area, the advent of point-of-care molecular diagnostic platforms offers up the perfect combination of noninvasive sampling with immediate diagnosis for most, if not all diseases or conditions. This is arguably the fastest growth area in oral diagnostics. Some of the tools/devices that have already made an impact in these two areas of the in vitro diagnostic industry are described below.

Of all the salivary diagnostics on the market today there is no doubt that OraSure Technologies’ OraQuick Advance HIV 1/2 rapid, oral fluid test for the HIV virus has made the greatest impact. This product launched internationally in 2000. Since then, the device has received FDA

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FIGURE 7:
OraQuick Advance
HIV 1/2 Rapid Oral
HIV Test (OraSure
Technologies)



FIGURE 8: DDS Rapid Drugs of Abuse System (Cozart Biosciences)



FIGURE 9: Securetec AG Drugwipe 5

approval and has changed the paradigm for clinical testing for HIV in the U.S. OraQuick Advance HIV 1/2 (**FIGURE 7**) has been adopted widely by governmental public health organizations including the Centers for Disease Control (CDC), Substance Abuse Mental Health Services Administration (SAMHSA) and the World Health Organization (WHO) overseas as a tool to identify HIV-infected individuals in nontraditional settings including mobile vans, bathhouses, emergency room situations and in publicly funded screening programs.

OraQuick consists of a fairly rigid pad connected to a lateral flow immunochromatographic (LFT) test strip. The user swabs the area under the gumline, collecting a specimen in a few seconds. The sample device is then immersed in a buffer/reagent solution in a tube provided by OraSure. The buffer is allowed to migrate up and onto the LFT test strip embedded in the device. After 20 minutes the results of the qualitative test are read. If a single line is observed the sample is negative. If two lines are observed, the result is classified as a “preliminary positive” result until the result can be confirmed by a more accurate test, usually Western blot analysis. The performance of OraQuick is equivalent or better than many FDA-approved ELISA tests for the HIV virus and has become a standard for diagnosis in the industry.

At the time of writing, the FDA is considering approval of the OraQuick device for over-the-counter use. If

approved (and approval seems likely), this could open the door for the development and commercialization of many other saliva-based rapid tests.

The area of roadside drug testing is another area where saliva testing has gained a foothold, mainly due to the convenience factor of being able to collect samples noninvasively from would be “drugged” drivers. Some technological challenges are still to be overcome, but several companies have met with some limited early commercial success. The net result is that a number of other companies are now targeting this area with novel technologies. The most notable successes so far have been Cozart Biosciences (Abingdon, U.K., concateno.com, now Alere, Inc., Waltham, Mass., alere.com), Securetec (Munich, Germany,

securetec.net) and Mavand (Mössingen, Germany, mavand.com).

Cozart developed the RapiScan drug testing system that incorporates saliva collection using the Saliva Diagnostic Systems Omni-SAL device in conjunction with a rapid lateral flow test that could be read by means of a hand-held reading unit (RapiScan). Test results are available in 10–15 minutes from start to finish for a series of six abused drugs. Cozart now markets an upgraded version of the RapiScan device, known as the DDS system (**FIGURE 8**).

Securetec AG’s DrugWipe 5 is a 10-minute test that detects up to six drugs following a very rapid collection of specimen by wiping the tongue until an indicator dye changes color to yellow. Results are read visually on the test strip (**FIGURE 9**).

TABLE 1

List of Representative Rapid Oral Drugs of Abuse Tests /Manufacturers

Manufacturer	Website	Product Name
American Bio Medica Corporation	abmc.com	OralStat
JAJ Scientific	jajinternational.com	QikTech
Innovacon (Alere)	innovaconinc.com	OrALert
Mavand	mavand.com	Rapid STAT
Envitec	envitec.com	SmartClip
Sun Biomedical	sunbiomed.com	OraLine
Branan Medical	brananmedical.com	Oratect XP
Ulti-med	ultimed.org	SalivaScreen
Varian	varian.com	OraLab 6
Securetec	securetec.net	DrugWipe 5



FIGURE 10: OraGene DNA Salivary DNA Collection Device (DNA Genotek)



FIGURE 11: DNA-SAL Salivary DNA Collection Device (Oasis Diagnostics)



FIGURE 12: SCS Collection System (Greiner Bio-One)

Mavand offers a multi-drug screen known as Rapid STAT that can detect up to seven drugs in 13 minutes or less without any instrumentation. Collection of saliva takes less than 30 seconds and results on the most recent surveys by the European body known as Roadside Testing Assessment or ROSITA (rosita.org) are promising.

This independent group is responsible for evaluation and validation of tools for drug testing at the roadside. For more information on salivary devices with applicability in law enforcement screening, see the ROSITA website, rosita.org. **TABLE 1** is a list of websites that summarize a number of other handheld drug tests that are available for abused drug testing in forensics, employment screening, workplace testing and criminal justice. This list is not comprehensive.

In the molecular diagnostics space, there is one supplier that has pioneered applications for salivary DNA collection. DNA Genotek, now owned by OraSure Technologies, launched the Oragene device (**FIGURE 10**) in two formats for simplified collection and stabilization of DNA from saliva samples. Statistics show that this device has been widely adopted in the personal genomics and research areas. In 2012, the Oragene device became the first salivary collection tool cleared by the FDA for clinical use when Oragene is used in conjunction with the GenMark Diagnostics eSensor test for Warfarin sensitivity.

In order to collect an Oragene specimen, the subject expectorates into a collection tube until a certain volume

of saliva has been collected (2 mL, 2 - 30 minutes). A proprietary buffer solution is released once the attached cap is screwed into place. This buffer solution acts to immediately stabilize the DNA present in saliva for a range of downstream applications. Oragene collects a large quantity of DNA, which is purified using reagents provided by the manufacturer and suitable for multiple diagnostic technologies. High-profile personal genomics companies, including 23andMe (Mountain View, Calif., 23andme.com) and Navigenics (Foster City, Calif., navigenics.com), that provide personal testing services to the general public have embraced the Oragene technology as a means of collecting samples safely and effectively directly from consumers.

The DNA-SAL Salivary DNA Collection device from Oasis Diagnostics (**FIGURE 11**) came to market in 2011 and works via a different mode of action. DNA-SAL is a “raking/scraping” tool that is used to abrade cells from the inside of the cheek by rubbing gently for 30 seconds. Some buccal/epithelial cells remain trapped on the device head, while others remain free flowing in saliva in the mouth. The loose cells are “harvested” using a small quantity of a safe stabilizing solution based upon a mouthwash formulation that is taken in the mouth, “swished” around for 15 seconds, and then expectorated back into the sample tube. DNA is immediately stabilized for long periods of time once the saliva comes in contact with the stabilizing rinse solution. DNA may then be

transported to the laboratory for isolation and downstream analysis, or as an alternative, Oasis provides a method for immediate downstream testing without DNA isolation with a simple sample manipulation.

What the Future Holds?

The future of salivary diagnostics is extremely bright. There are a number of new tools and technologies coming to market simultaneously that are perfectly set up for noninvasive sampling. A number of additional areas hold great promise for salivary testing, but this final section will focus on three areas poised for arguably the greatest growth: saliva collection; point-of-care testing (MDx, proteins, small molecules, etc.); and clinical/research molecular diagnostics (MDx) using RNA/DNA.

Saliva Collection

The increased awareness of saliva as a specimen of choice has spawned a new generation of tools for saliva collection. These new tools increase the opportunities for testing both near the patient and using downstream laboratory technologies. Specific examples of tools likely to have the greatest impact on testing regimens are:

- Greiner Bio-One SCS Saliva Collection System (Monroe, N.C., us.gbo.com)

The SCS Saliva Collection System (**FIGURE 12**) is a series of tubes, reagents and a sample cup for general-purpose saliva collection.



FIGURE 13: Saliva Collection Aid (SalivaBio)

To collect saliva using the SCS system, the user rinses the oral cavity with the first of a number of safe reagents and expectorates the liquid back into the sample cup provided. A separate, unopened sampling tube is immersed in the saliva sample collected, causing the collected sample to run up and into this secondary tube. Once filled, the sample is stable for analysis or for transportation to a laboratory.

■ SalivaBio Saliva Collection Aid (Baltimore, salivabio.com)

This is a brand new device developed by researchers at Johns Hopkins School of Nursing. The Saliva Collection Aid was originally developed for hormonal analysis, but has greater applicability and may be used for most applications where saliva is required. The device works by expectorating saliva into the Saliva Collection Aid, a plastic funnel type device (**FIGURE 13**). The “plastic funnel” component is connected directly to a transport tube provided by the manufacturer. The tube is capped and sent to a laboratory for processing.

■ Oasis Diagnostics Super-SAL/iSCPSS device

The Oasis Diagnostics Super-SAL device (**FIGURE 14**) is a device for the collection of greater than 1.0 mL of saliva in a short time for laboratory testing for small molecules, antibodies and antigens. This device uses a cylindrical pad to collect saliva from in the mouth alongside the tongue for 30 - 45 seconds. Sample sufficiency is indicated by the change in appearance of a Sample Volume Adequacy Indicator (SVAI) built into the device. Once the SVAI is triggered, the sample is



FIGURE 14: Super-SAL (Oasis Diagnostics)

squeezed through a compression tube and into a standard Eppendorf-compatible tube. Pure, whole saliva may then be immediately processed or sent to the laboratory for subsequent testing

Oasis Diagnostics is also collaborating with David Wong's, DMD, DMSc laboratory at the University of California, Los Angeles, to commercialize a device called iSCPSS, the Integrated Saliva Collection Processing Stabilization and Storage System, which integrates the Oasis Super-SAL device with components necessary to separate and independently stabilize both RNA and proteins for downstream research or clinical studies. The iSCPSS device (**FIGURE 15**) incorporates a proprietary filtration unit, which provides cell-free saliva that is subsequently separated into two distinct fractions. The two fractions are stabilized separately with specified reagents to yield long shelf life fragments that are assay ready. This device became available commercially at the end of 2012.

Point-of-Care Devices

The pending FDA approval for an over-the-counter application for the OraQuick Advance Oral Fluid HIV test is anticipated to lead to the development of a new generation of saliva-based lateral flow (LTF) assays that “piggy-back” on a number of available enabling technology platforms. The author notes already the availability of oral based tests for measles IgM from Microimmune and the Public Health Laboratory Branch at Colindale in the U.K.⁴, CRP from the University of Queensland⁵ and test development in process for cortisol



FIGURE 15: iSCPSS RNA/Protein Collection System (Oasis Diagnostics)

from Foresite Diagnostics (York, U.K., foresitediagnostics.com) and Oasis Diagnostics.^{6,7} Areas of growth are likely to be the areas of general wellness, infectious diseases, roadside drug testing and cardiovascular disease diagnosis.

The advent of point-of-care devices for nucleic acid testing (NAT) from companies such as TwistDx (York, U.K., twistdx.co.uk), Biohelix (Beverly, Mass., biohelix.com), Rheonix (Ithaca, N.Y., rheonix.com) and others could offer up new opportunities for oral testing. Currently these devices are based upon blood sampling technologies and would clearly benefit from a noninvasive sample source.

Clinical/Research Diagnostics Using RNA/DNA

Since the discovery of polymerase chain reaction (PCR) and other molecular techniques, the use of DNA as a building block for diagnostics has grown rapidly. Market sources from 2010 estimate that more than 500 million molecular tests are done annually in the United States and that this number will grow to 750 million by 2014.

A fraction of these tests already use saliva as a sample source, but trends indicate that as current studies are published confirming the efficacy

of saliva as an ideal specimen, the proportion of oral based tests will rise sharply. In addition, new research using RNA, including mRNA and miRNA, and proteins (proteomics) as diagnostic tools will only add new markets where saliva will be a specimen of choice.

Conclusion

The future of saliva testing is extremely bright with a number of exciting and functional techniques offering up noninvasive and cost-effective solutions for diagnosis that will find value in disease diagnosis all over the world. ■■■■

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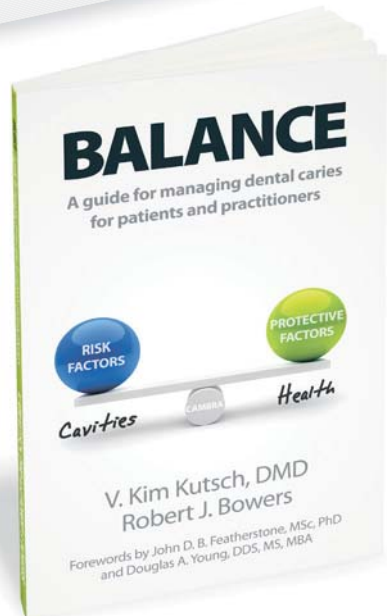
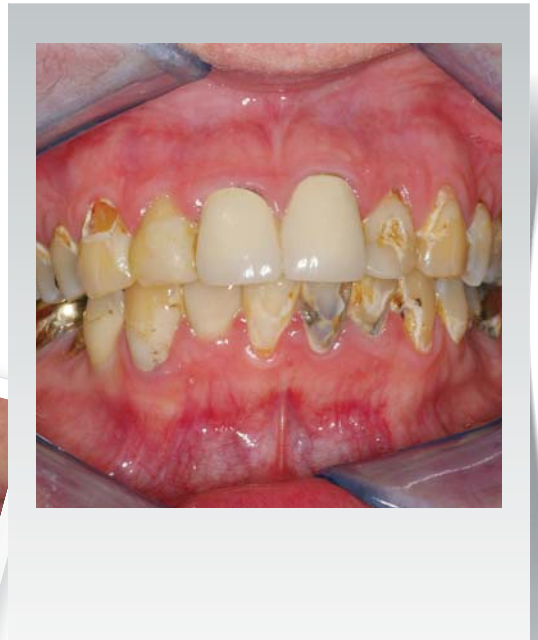
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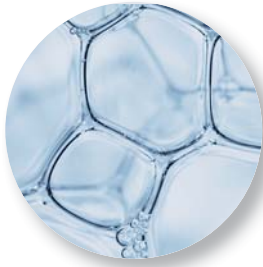
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Salivary Biomarkers for Caries Risk Assessment

LIHONG GUO, DDS, PHD, AND WENYUAN SHI, PHD

ABSTRACT Saliva contains various microbes and host biological components that could be used for caries risk assessment. This review focuses on the research topics that connect dental caries with saliva, including both the microbial and host components within saliva.

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Conflict of Interest

Disclosure: None reported.

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Conflict of Interest

Disclosure: Wenyuan Shi serves as a part-time chief science officer of C3 Jian Inc., a California-based biotechnology company.

ACKNOWLEDGEMENT

This work was supported by a grant from the National Institute of Health (NIH-1-R01-DE020102) and a grant from the Natural Sciences Foundation of China (30672322).

Dental caries is recognized as a multi-factorial infectious disease caused by complex interactions among acid-producing bacteria, fermentable carbohydrates and many host factors including saliva.¹ It remains a major health issue in the United States and worldwide with a prevalence of more than 40 percent in young children and about 90 percent in the adult population.² Its prevalence rate in childhood is five times higher than the next most prevalent disease, asthma.³ Despite the dramatic reduction in caries rates over the last decades, it still affects 60 to 90 percent of school-aged children and adults.^{4,5} In many countries, severe caries still exists in all age groups,^{6,7} which creates huge social and economic burdens.⁸

Importance of Caries Risk Assessment

Currently, dental caries is mainly treated by restorative approaches, which do not always generate optimal

satisfactory results. Caries risk assessment allows for the estimation of the probability of caries incidence, i.e., number of new cavities or incipient lesions in a certain time period, as well as the probability of the changes in the size or activity of caries lesions.⁹ An accurate caries risk assessment can identify patients at high caries risk for preventive therapies and improved treatment effectiveness. Therefore, more attention has been given to this topic lately.¹⁰ In particular, the roles of saliva and its biological components have been extensively studied for their possible relevance to dental caries, which is the focus of this review.

Anti-caries Effects of Saliva

Whole saliva is a complex mixture of oral fluids which is composed of salivary gland secretions, gingival crevicular fluid, expectorated bronchial and nasal secretions, serum and blood derivatives

from oral wounds, bacteria and bacterial products, viruses, fungi, desquamated epithelial cells, other cellular components, as well as food debris.^{11,12} Saliva plays many important roles in maintaining oral health. van Nieuw Amerongen et al.¹³ summarized various protective functions of salivary proteins on teeth integrity, including cleaning teeth, protecting against abrasion and attrition, retarding demineralization as well as promoting remineralization, rapidly neutralizing acids, and defending the oral cavity from infection.

Saliva provides some real potential in evaluating dental caries risk. Lack of saliva predisposes the development of atypical or unusual dental decay, i.e., cervical, incisal or in cusps tips, as well as radicular lesions.¹⁴ Edgar and Higham¹⁵ categorized the anti-caries effects of saliva as static or dynamic. Static effects are those which may be assumed to be continuous effects exerted on the microbial composition of plaque through antimicrobial or metabolic factors, protective effects of salivary pellicle formation and the effects of salivary electrolytes (including fluoride) in maintaining a supersaturated environment for the tooth mineral. Dynamic effects, on the other hand, are those which are correlated with the flow rate following salivary stimulation and are mobilized over time as indicated by the Stephan curve.¹⁶ These include the clearance of the acid products of plaque metabolism following sugar challenge, and the buffering capacity for restoring plaque pH towards neutrality.¹⁷ Saliva is also known to contain pH-raising factors such as sialin, arginine and urea.¹⁸ Acid produced by acid-producing bacteria following sugar fermentation causes plaque pH values to fall below a critical value resulting in demineralization of tooth surfaces.¹⁹ However, demineralization can be reversed in its

early stages. Supersaturation of saliva with calcium, phosphate and fluoride allows remineralization of teeth at this stage.²⁰

Caries-associated Microorganisms in Saliva

Over the past few decades, extensive research has provided significant information regarding the connection between dental caries and salivary bacteria.²¹ A primary etiological factor of caries is acid production from dietary carbohydrates by bacteria in saliva

LACK OF SALIVA predisposes the development of atypical or unusual dental decay, i.e., cervical, incisal or in cusps tips, as well as radicular lesions.

and plaque. Potentially cariogenic bacteria are usually present in relatively small quantities in healthy saliva and plaque. However, with biological and environmental perturbations such as the increased frequency of fermentable carbohydrate consumption, conditions of low pH will favor the proliferation of acid-tolerating (and acidogenic) bacteria. When the cariogenic bacteria dominate the saliva and plaque, more acids are produced at even faster rates, thereby enhancing the prevalence of these cariogenic bacteria.²²

Dental caries-associated oral streptococci are called the mutans streptococci,^{23,24,25} with *Streptococcus mutans* (*S. mutans*) and *Streptococcus sobrinus* (*S. sobrinus*) being the predominantly prevalent caries-associated species in humans.

Among the physiological traits of mutans streptococci which are most relevant to cariogenesis are their synthesis of extracellular polysaccharides from sucrose which fosters their firm attachment to teeth and promotes tight cell clustering, rapid fermentation of carbohydrates to acids and tolerance to low pH.^{24, 25} It has been demonstrated that mutans streptococci can colonize the mouth of pre-dentate infants and are acquired by both vertical and horizontal transmission from human reservoirs, especially mothers.^{26,27} The earlier in infancy that high salivary mutans streptococci counts occur, the more severe the caries in the primary dentition.^{28,29} Mutans streptococci also exhibit a much higher prevalence and higher proportions in caries-positive subjects than caries-free individuals.^{22,30} Among mutans streptococci, *S. mutans* has often been associated with the initiation and progression of dental caries and is generally considered as the principal agent for human dental caries.^{23,31} It is frequently isolated from caries lesions and is able to induce caries formation in animals fed a sucrose-rich diet.^{32,33} Its prevalence in human caries cases ranges from 70 to 100 percent.²³ In two large-scale microbiological studies, *S. mutans* has been linked to crown caries in children and adolescents,^{34,35} and to root caries in elderly patients.³⁶ By 16S rDNA phylogenetic profiling of dental caries-associated flora, *S. mutans* was found extensively in caries-active subjects.^{34,35,37} Suppression of high levels of *S. mutans* in a mother might delay or prevent the colonization of the organism in her child.³⁸ In fact, the delayed colonization of *S. mutans* can result in a reduction in dental caries.³⁹

Lactobacilli have also been implicated as important contributory species in dental caries,^{34,35,37} but their role in initiation of caries is not well supported. They are highly acidogenic and aciduric,⁴⁰ but do not

avidly colonize the tooth enamel.⁴¹ Instead, they are often cultured from established carious lesions.⁴²

van Houte et al. proposed that non-mutans streptococci, including *S. sanguinis*, *S. oralis*, *S. gordonii*, and *S. mitis*, could contribute to dental caries as well.^{43,44} Among non-mutans streptococci, some are acidogenic and aciduric⁴⁵ but less evidence exists of their virulence in experimental animals than either the mutans streptococci or the lactobacilli. In some cases, the data suggest an inverse relationship between the prevalence of non-mutans streptococci and the mutans streptococci, and this relationship is also correlated with caries development.^{46,47}

There is also evidence which links *Actinomyces* spp. to the onset of root surface caries.^{43,48,49} *Actinomyces* have been shown to induce root surface caries in animals.⁵⁰ They can also metabolize carbohydrates but are not particularly acidogenic nor acid tolerant compared to mutans streptococci and lactobacilli. More recently, Mantzourani et al. correlated the prevalence of the family *Bifidobacteriaceae* with cavitated root caries lesions.⁵¹

The presence of *Candida* species in the oral cavity is usually found to be positively correlated with poor oral hygiene and high carbohydrate intake.⁵² Recently, *Candida* species have also been associated with dental caries.^{53,54} Studies of oral *Candida* species suggest their cariogenic potential since they exhibit acidogenic hetero-fermentative properties, especially in the presence of carbohydrates,^{55,56} and coaggregation with other bacteria in biofilms.^{57,58} Some studies demonstrated that subjects in a caries-active group showed a high frequency of oral candidal carriage compared to caries-free subjects⁵⁹ and reported a positive correlation between *Candida* and one-year caries increments.⁶⁰

Therefore, although the mutans

streptococci are primarily implicated in dental caries induction, other non-mutans microorganisms could also contribute to this disease.

Caries Risk Assessment Via Analyzing the Levels of Cariogenic Bacteria in Saliva

More than 700 oral microbial species have now been identified, making oral flora one of the most complex microbial communities in the human body.^{61,62} Saliva could act as an oral circulating

PREVIOUS STUDIES HAVE shown a significant correlation between the salivary concentration of mutans streptococci and their proportions in plaque.

fluid for bacterial transmission and act as a reservoir for bacterial colonization.⁶³ Bacteria, including anaerobic species, can survive in saliva and utilize salivary constituents for growth.^{64,65} There are about 10^8 to 10^9 CFU/mL oral microorganisms living in saliva.²³ These salivary microbial species reflect the oral microbial community composition and could serve as a biomarker of the health and disease status of the oral cavity. Saliva allows dental plaque to flourish and also detaches layers of plaque.^{66,67} Therefore, bacteria can also be released from plaque.⁶⁸ The level of certain bacterial species in saliva can reflect their presence in plaque.^{69,70} Previous studies have shown a significant correlation between the salivary concentration of mutans streptococci and their proportions in plaque.^{21,71} The levels

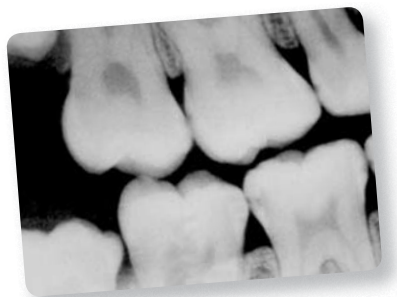
of cariogenic species in saliva have been investigated as a potential tool for caries risk assessment.^{21,24,46,72}

The Levels of Salivary Mutans Streptococci and Lactobacilli

Many studies have demonstrated that increased proportions of mutans streptococci and lactobacilli in saliva are correlated with increased caries initiation and progression,^{21,23,30,73} as well as the presence of root caries.⁷⁴ Thenisch et al. summarized 981 reports assessing the association of mutans streptococci and caries in preschool children and concluded that the presence of mutans streptococci in the saliva of young caries-free children appears to be associated with a considerable increase in subsequent caries risk.⁷⁵ Regarding the relationship between early childhood caries (ECC) and mutans streptococci, Parisotto et al. also undertook a systematic review and concluded that the salivary mutans streptococci level is a strong risk indicator for ECC⁷⁶. Subjects with multi-surfaced restorations had significantly higher levels of salivary mutans streptococci and the potential for continued caries activity when compared to those without restorations and are caries-free.⁷⁷ Less convincing data are available relative to the possible association between salivary lactobacilli levels and caries onset.²⁴ Lactobacilli likely do not play any significant role in the initiation of dental decay. However, once a lesion has been established, its proportions were seen to increase.⁷⁸ The level of salivary lactobacilli appears to reflect sugar consumption by the host.⁷⁹ Therefore, salivary lactobacilli level could be indirectly related to caries progression.⁸⁰

As for the predictive threshold of salivary mutans streptococci and lactobacilli, no absolute values for high or low values have been established. For example, Krasse and Fure proposed that

Spotting caries is a piece of cake,



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10^5 mutans streptococci per milliliter of saliva could be considered a high value in a person with only a few teeth and no restorations. However, 10^6 might not be an extremely high value in a person with many restorations.⁸¹ As for lactobacilli, counts of 10^4 CFU/mL in saliva would be considered low; high values would equal or exceed 10^6 CFU/mL in saliva.⁷¹

Studies on sensitivity, i.e., the probability that caries-active individuals have high values for *S. mutans* or lactobacilli, varied from 44 to 71 percent and it is lower than their specificity (56 to 100 percent), i.e., the probability that individuals without new caries or a low caries incidence have low values for these species.^{82,83} This suggests that the negative predictive value might be more accurate compared to the positive predictive value. Therefore, salivary mutans streptococcal counts have better predictive value for selecting people who will not develop caries (i.e., high specificity) than for identification of individuals who will (i.e., high sensitivity). Considering the multi-factorial nature of caries, the caries predictive power should increase when other relevant factors such as previous caries experience are included.⁸⁴

The predictive value of salivary levels of mutans streptococci has been evaluated in many studies; however, the results are not consistent. Although some studies found a significant association between salivary levels of mutans streptococci and subsequent caries onset,⁸⁵ other studies revealed no clear-cut association between them.^{86,87} The observed discrepancies could also be due to the different methods used to detect salivary mutans streptococci. Excellent positive predictive values for *S. mutans* were found for young children ages 2 to 4 years²⁸ and for children ages 12 to 13 years.⁸² The prediction of low caries risk by salivary

mutans streptococci and lactobacilli counting appears to be more reliable than for estimating high caries risk.^{21,88} Therefore, salivary mutans streptococci and lactobacilli counting might not be the sole predictor for caries and multi-factorial tests would be more reliable.^{72,89,90}

Both Larmas⁷¹ and Messer⁹¹ suggested that salivary mutans streptococcal tests be used for pre-selection of patients for dental examination, demonstration of cariogenic infection, evaluation of the effectiveness of chemotherapeutic rinses and providing

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for an objective measure of treatment outcomes. As for salivary lactobacilli tests, it was proposed that these be used for planning recall intervals, for evaluating sucrose consumption and sometimes for those medically compromised patients and patients with open carious lesions or orthodontic bands.^{71,91}

The Levels of Other Salivary Caries-associated Bacteria

The predictive power of salivary levels of non-mutans streptococci or *Actinomyces* for caries initiation and progress has not been evaluated rigorously and such an association remains equivocal.

The role of salivary yeasts in caries risk assessment has not been studied extensively but these organisms may contribute to overall microbial acid

production,⁵⁶ and the associations between caries increment and salivary *Candida* could be observed in children,⁹² suggesting that salivary yeast levels could be a potential caries predictor in children. Pienihäkkinen⁹³ proposed that salivary *Candida* levels had better caries predictive power than salivary lactobacilli levels. A salivary yeast test could be used for confirming the hypo-salivation status of a patient and for evaluating the effectiveness of anti-fungal therapy.⁷¹

Caries Risk Assessment Via Analyzing Host-related Factors in Saliva

Salivary Flow Rate

The half time for saliva clearance is much shorter than the time required for oral bacterial cell division. Therefore, these bacteria cannot survive in the mouth unless they have the ability to bind to teeth or the oral mucosa.⁹⁴ In the mouth, there is an equilibrium between the number of free bacteria in saliva and the number bound to the teeth or to oral epithelial cells. Low salivary flow rate is a risk factor for caries incidence.⁹⁵ The most common alterations in salivary flow rate involve reduced secretion, which may be influenced by medications, pathological changes in the salivary glands, and age, etc.^{96,97,98} It is considered a potential risk factor when the unstimulated salivary flow rate is lower than 0.30 mL/min^{71,99,100} and the stimulated salivary flow is lower than 0.7 mL/min.¹⁰¹

Salivary pH and Buffer Capacity

Previous studies have shown larger quantities and faster rates of acid production in caries-active individuals than that in caries-free individuals.²³ The quantitative assessment of resistance to pH changes is referred to as buffer

capacity. There is reasonably strong evidence to indicate that salivary buffering capacity protects the tooth from dental caries.¹⁰² Low buffering capacity is usually associated with caries development because of its impaired neutralization of plaque acids and reduced remineralization of early enamel lesions.^{103,104,105} Furthermore, an association between low caries levels and high salivary buffering capacity has been also demonstrated.^{106,107} Individuals with a high salivary buffer capacity are often caries-resistant.⁷¹

Salivary Proteins

Mandel et al. found no difference in parotid saliva protein levels between caries-free and caries-active adults.¹⁰⁸ However Balekjian et al. observed that a caries-rampant group exhibited a significant reduction in the salivary level of basic proteins and a significant increase in amylase compared to a caries-free group.¹⁰⁹ There are also studies that suggest that some proteins in saliva from caries-active and caries-free individuals may have different levels of biological activity.^{110,111,112,113} Salivary proteins from caries-active individuals were consistently found to support better growth of *S. mutans* or *S. sanguis* than comparable secretions from caries-free subjects and had a much greater potency for promoting saliva-mediated adherence and lower capacity to induce saliva-mediated aggregation.

Salivary mucins play a major role in the health of the oral cavity.^{11,114} MUC7, one of the predominant mucins in saliva, has been reported to interact with several strains of streptococci by promoting their agglutination.^{115,116} Diminished levels of MUC7 were found to be significantly associated with elevated *S. mutans* titers, which

raises the possibility that dramatically reduced levels of MUC7 might serve as an important predictor in caries risk assessment for older adults.¹¹⁷

There are contradictory results in terms of finding a relationship between caries prevalence and salivary proline-rich proteins (PRPs).^{118,119,120,121} Salivary glycoproteins participate in the formation of the acquired enamel pellicle, whose constituents will influence initial microbial colonization on tooth surfaces and may therefore affect the microbial composition

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of plaque. Specific oligosaccharides of salivary glycoproteins could either facilitate bacterial attachment and colonization at the surface of teeth or protect against colonization by promoting agglutination and removal of free bacteria. Based on the pattern of genetically determined oligosaccharides present on salivary glycoproteins, Denny et al. developed a new saliva test for caries risk assessment.¹²² They found that the levels of selected oligosaccharides correlated with caries incidence in young adults.

Low salivary levels of alpha-defensins HNP1-3 may represent a biological factor that contributes to caries susceptibility in children.^{123,124} Using a proteomic approach, Rudney et al. suggested that salivary levels of statherin and cystatin S may be potential risk indicators for caries development.¹²⁵

Higher levels of statherin and cystatin S were detected in caries-free children.¹²⁶

Salivary IgA antibody responses to mutans streptococci can be observed in early childhood.¹²⁷ The levels of specific secretory IgA (SIgA) showed a relationship with caries risk, and the literature is nearly equally divided for and against an anticaries role for specific SIgA.¹⁰² As for salivary innate non-immunoglobulin factors, none of the salivary antimicrobials (lysozyme, lactoferrin, total peroxidase activity, hypothiocyanate and thiocyanate) has sufficiently strong association to caries initiation and progress.^{102,128} However Mungia et al.¹²⁹ reported an association between caries experience and the concentrations in submandibular or sublingual gland saliva of lactoferrin, albumin, lysozyme, mucins and cystatins. They also indicated that changes in saliva output during ageing correlated with greater caries risk and may be an indicator of caries risk.

New Tools for Salivary Risk Assessment of Caries

Salivary Bacteria Counts

Culture-based methods

Based on microbiology-related caries-risk predictors in saliva, most of the salivary microbial tests by far have been focused on mutans streptococci and lactobacilli. Culture-based methods are a common way to characterize the proportion of salivary mutans streptococci and lactobacilli on selective media. Gold et al. described a selective medium based on the mitis salivarius bacitracin agar (MSB) for mutans streptococci, which were found to be resistant to bacitracin.¹³⁰ However, the major limitation of MSB is its relatively short shelf life with a maximum of one week. This is particularly inconvenient

when the plates are used in a clinical setting. Mitis salivarius bacitracin broth (MSBB) was developed by Matsukubo et al. with a longer shelf life. In this medium, the concentrations of bacitracin and sucrose were chosen to obtain distinct characteristic colonies and good colonial adhesion to the glass.¹³¹

In 1940, Snyder described a simple colorimetric test for the indirect determination of the counts of lactobacilli in saliva.¹³² Saliva was added to tubes of a selective (pH 5.0) liquefied agar medium. A change in the color of the indicator brom-cresol-green from green to yellow after 48 hours of incubation was indicative of more than 10^3 lactobacilli per mL of saliva. A further refinement in the cultivation of lactobacilli was an improved selective medium introduced by Rogosa et al. in 1951.¹³³ This medium allows for growth of an extended spectrum of oral lactobacilli and is still the basis of modern diagnostic salivary lactobacilli tests.

Dip-slide Methods

Compared with conventional agar plate techniques, dip-slide tests have been shown to be reliable methods for determining salivary levels of mutans streptococci and lactobacilli.^{134,135} At present, all the commercial dip-slide methods for determining the proportion of mutans streptococci in saliva are based on the fact that bacitracin inhibits the growth of all other oral streptococci except mutans streptococci on MSB medium. Currently available commercial kits for detection of salivary lactobacilli are mostly based on Rogosa's medium.

Dentocult SM and LB whose use results in significant correlation with the conventional-selective-culture-based methods have been shown to provide a

good microbiological assessment of mutans streptococci and lactobacilli, respectively, in the saliva.^{134,135,136} Dentocult Strip Mutans Test and Caries Screen SM (Orion Diagnostica, Espoo, Finland) are other simple diagnostic tests allowing for gross enumeration of salivary mutans streptococci outside of a bacteriology laboratory under both clinical and field conditions.^{134,137} Based on Nickerson medium, a dip-slide system, Oricult-N, is also available for measuring oral yeast infections.⁹⁶

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Molecular Methods

Assessment of caries risk undoubtedly would benefit from newly emerging technologies. More sensitive DNA-based methods including checkerboard DNA-DNA hybridization, genomic fingerprinting, 16S rRNA gene cloning and sequencing, or T-RFLP are also being utilized in identification and classification of dental caries microbiota.^{138,139,140} Polymerase chain reaction (PCR)-based bacterial identification can detect a large array of microorganisms in saliva and provides accurate measurements of the known cariogenic species in saliva.¹⁴¹ The real-time quantitative polymerase chain reaction (qPCR) technique was found to be more sensitive for enumeration of *S. mutans* in saliva compared to the traditional culture-based methods.¹⁴² Polymerase

chain reaction-denaturing gradient gel electrophoresis (PCR-DGGE) profiling and species identification could serve as a community-based molecular technique and allow for the study of the oral bacterial community structure associated with severe dental caries.¹⁴³ In addition to intact microorganisms, DNA and RNA released from microorganisms also exist in saliva. Oral streptococcal 16S rRNA/rDNA was identified in the liquid phase of saliva,¹⁴⁴ which suggests a new possibility for oral pathogen detection since the liquid phase of saliva could be directly used for 16S rRNA/rDNA detection without requiring bacterial cell isolation.

The availability of high-throughput DNA sequencing technology together with the rapid expansion of bacterial genome data has now made it feasible to identify the primary bacterial residents in saliva.^{145,146,147} Currently, human oral microbiome studies are still in their infancy and large-scale projects are in progress. Their results should become available in the next few years. It is anticipated that such high-throughput sequencing will assist in identifying potential cariogenic species that may not have been detected using currently available technologies such as 16S rRNA analysis. Recently, one group in China investigated salivary microbiota in both caries-active and normal human populations by cross-validating 16S rRNA gene amplicon-based and whole-genome-based deep-sequencing technologies including 454 pyrosequencing and Solexa sequencing.¹⁴⁸ Its findings raised the possibility of exploiting salivary microbiomes as diagnostic markers of caries.

Another enabling technology for salivary cariogenic bacteria detection is the monoclonal antibody (MAb) technique. Different bacteria present unique surface proteins and

polysaccharide structures on the cell surface. MABs can be raised against these structures and detect the corresponding bacterial species with very high specificity and sensitivity. These antibodies can be linked to various detection systems, such as fluorescent, colorimetric or coagglutination reagents. MAB-based detection methods allow a rapid and accurate way to quantitatively measure cariogenic bacteria. They have significant advantages compared with traditional culture growth assays or PCR techniques. By linking fluorescent dyes to these MABs, researchers can track bacterial species *in situ* and in real-time. MABs against the cariogenic species *S. mutans*, *Lactobacillus casei* and *Actinomyces naeslundii* with 91 percent sensitivity and 96 percent specificity have been developed in our laboratory.^{149,150,151} These MABs were conjugated to different fluorescent dyes and can quantitatively and accurately detect cariogenic bacteria in saliva.¹⁵² Matsumoto et al. also developed an anti-*mutans streptococci* MAB.¹⁵³

Assaying Host Factors

Salivary flow rate can be measured in the resting or stimulated states. The usual salivary collection methods include a draining method using a Proflow Sialometer, a spitting method, a suction method, swab or absorbent methods and the use of a salivette.^{154,155} The Schirmer tear test is also used in salivary measurements.¹⁵⁶ Salivary flow rates can be stimulated by a range of oral and physiological stimuli. Chewing paraffin wax is the most common saliva stimulating method.

At present, commercial dip-slide kits that provide for measurement of salivary flow rate, salivary pH and buffering capacity are available for convenient and rapid clinical tests.

Saliva-Check (GC America, Alsip, Ill.) is a salivary testing kit that tests for hydration, salivary consistency, resting saliva pH, stimulated saliva flow and pH, and saliva buffering capacity.¹⁵⁷ The Fosdick calcium dissolution test can measure the quantities of powdered enamel dissolved in four hours by acid formed when the subject's saliva is mixed with glucose and powdered enamel.^{158,159} Both Wach's¹⁶⁰ and Rickles' tests¹⁶¹ could determine acid production in a saliva-sugar mixture. Some researchers utilized

FINDINGS RAISED the possibility of exploiting salivary microbiomes as diagnostic markers of caries.

optical spectroscopic sensors to monitor the bacterial-mediated acidogenic-profile of saliva and found that the sensors were able to detect significant differences in the salivary acidogenic-profiles between subjects of different caries status, which highlighted the possibility that optical spectroscopic sensors might be used as a point-of-care testing tool for caries-risk assessment in children.¹⁶² Salivary buffer capacity can be measured by the Dentobuff method,¹⁶³ in which a dip-slide is coated with chemical indicators and immersed in the saliva. The resulting color is indicative of the capacity of the saliva to buffer acids and bases. More recently, a Dentobuff strip (Orion Diagnostica, Espoo, Finland) has also been devised for the same purpose.¹⁶⁴

Perspectives

Dental caries is a multi-factorial infectious disease that involves complex interactions among acid-producing bacteria, fermentable carbohydrates and many host factors. Interestingly, almost all these components could be detected in saliva, making saliva-based caries risk assessment a real possibility.

We expect that ongoing innovative research and development will have a significant impact on dental caries prediction and control. We envision that in the future, treating dental caries will be an evidence-based dental practice emphasizing the triple-pronged approach of early detection, effective and sustainable treatment and prevention. Specifically, detection of microbial and host-related caries risk factors can become routine. This approach will help clinicians to reinforce the concept of dental caries as an infectious process and will facilitate immediate, evidence-based treatment decisions. ■■■■

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Salivary Biomarkers in the Diagnosis of Periodontal Diseases

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ABSTRACT Periodontal diseases are considered some of the most prevalent diseases in the adult population, affecting as much as 80 percent of people. Diagnosis can be performed by measuring pocket depth and bleeding upon probing. These diseases can be easily addressed in their early stages, but many choose to ignore the signs and symptoms. Saliva has recently emerged as a potential tool to aid in the diagnosis of periodontal diseases and the prediction of treatment outcomes.

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Conflict of Interest
Disclosure: None reported.

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Conflict of Interest
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Conflict of Interest
Disclosure: None reported.

ACKNOWLEDGEMENT

The authors thank David T. Wong, DMD, DMSC, director of the Dental Research Institute at the University of California, Los Angeles, School of Dentistry, for reading their manuscript critically and providing helpful suggestions.

Gingivitis and periodontitis are chronic inflammatory conditions that may affect as much as 80 percent of the adult population, making them one of the most prevalent diseases in humankind.^{1,2} The disease process is initiated when bacteria accumulates along the gingival margin and in the interface between the gingival tissues and the teeth. Bacterial cells initially colonize the acquired salivary pellicle. If their accumulation is not disturbed by oral hygiene practices, bacteria will grow and proliferate, giving rise to a complex structure currently termed bacterial biofilm.³ As the biofilm develops and matures, bacterial succession occurs, which refers to the ability of bacterial species other than the ones initially colonizing the salivary pellicle to establish themselves within the extracellular polysaccharide matrix and the already attached bacteria.^{4,5} Bacterial succession

is responsible for a pathogenic shift in the gingival/periodontal flora, where the proportion of gram-negative anaerobes tends to increase as the biofilm matures.

Gingival tissues respond to the accumulation of bacteria and the exposure to bacterial products with inflammation.⁶ The inflammatory changes are confined initially to the soft tissues and involve clinical changes in volume, color, shape, position and texture of the gingival tissues, and are often accompanied by bleeding upon probing. The clinical condition is termed gingivitis, which is associated neither with apical migration of the junctional epithelium nor with destruction of bone and periodontal ligament fibers. Gingivitis is a reversible condition that can usually be treated with professional biofilm removal and improved oral hygiene. Most, but not all, cases of long-standing gingivitis progress into periodontitis. Periodontitis is an inflammatory condition of the



FIGURE 1A.



FIGURE 1B.

FIGURE 1. Bleeding on probing in the diagnosis of periodontal diseases. Clinical periodontal evaluation involves visual assessment of the gingival tissue and sulcus/pocket probing. The absence of bleeding upon probing is an excellent negative predictor of disease activity (**1A**). The presence of bleeding on probing over estimates the risk for further tissue breakdown (**1B**) but it is still widely used in clinical practice because a better predictor has not been identified.

supporting structures of the teeth and involves attachment and bone loss. If left untreated, periodontitis may lead to tooth loss.⁷ Periodontitis occurs because the inflammatory process migrates through the gingival tissues in the apical direction, following the paths of larger blood vessels. The inflammatory process contains numerous enzymes and cytokines, notably collagenases and prostaglandins, which degrade collagen and induce the activation of osteoclasts, resulting in attachment and bone loss.^{8,9} Clinically, periodontitis shares signs and symptoms with gingivitis, but it differs from the latter by showing apical migration of the junctional epithelium from the cemento-enamel junction, which results in increased pocket depth (**FIGURE 1**). As pockets increase in depth, biofilm removal becomes more difficult, leading to the development of more inflammation and tissue destruction that contribute to the perpetuation of periodontitis.

Current Status of the Diagnosis of Periodontal Diseases

The diagnosis of periodontal diseases is usually made by a dental practitioner. It includes visual inspection of the gingival tissues, the measurement of pocket depth

and attachment loss, the observation of bleeding upon probing and the evaluation of other clinical parameters such as gingival recession, tooth mobility and furcation invasions.¹⁰ Radiographs are used as supporting information to the clinical findings as they reveal bone levels around teeth, as well as providing other information about teeth and mineralized tissues. Inflammation in gingivitis and in periodontitis presents several but not all cardinal signs and symptoms of inflammation in other areas of the body. Inflamed gingival tissues often appear swollen with rolled borders, which are present with soft textures and redness (as opposed to pink). On the other hand, the presence of pain and fever, which are often associated with the presence of inflammation in other areas of the human body, are usually missing from the clinical picture associated with gingivitis and periodontitis.¹¹

The absence of pain in periodontal diseases is usually one of the main reasons why patients do not seek professional care in their early or even more advanced stages. This is particularly true for the segment of the population who do not receive regular dental care in the form of periodic exams and preventive professional



FIGURE 2. Oral fluid periodontal health test (home or office use). An electrochemical device that can process transcriptomic biomarkers in saliva is shown. When a saliva-containing strip is inserted into the device, the outcome of the patient's periodontal health is displayed on the screen. The device would come with follow-up instructions to consult with a dentist.

dental recalls. Patients may not be aware of and/or choose to ignore the signs and symptoms of gingival and periodontal inflammation such as red and bleeding gums, thus allowing the disease process to progress to a point at which it may require extensive periodontal treatment or where tooth loss can no longer be prevented.

The Future of the Diagnosis of Periodontal Diseases

A self-administered home test that serves as a screening tool for periodontal diseases could play an important role in making individuals aware that a pathological process is occurring in their oral cavities and that a visit to a dental services provider should be prioritized (**FIGURE 2**). An analogy to such a screening test is a home pregnancy test. Females who show positive results are encouraged to visit their physicians to confirm their pregnant statuses and then receive appropriate care. In the case of periodontal diseases, saliva serves as an attractive vehicle on which a screening test could be conducted. Saliva is in close proximity with sites that are present with gingival and periodontal inflammation; therefore, it contains biological markers associated with these diseases. Moreover,

saliva is an abundant fluid that is easy to collect and store, making it a convenient medium for conducting a high sensitivity screening test for periodontal diseases.

The conversion of gingivitis into periodontitis and the progression of attachment and bone loss in periodontitis are phenomena that are still not fully understood in the pathogenesis of periodontal diseases. It is evident that most cases of untreated and long-standing gingivitis will convert into some degree of periodontitis, and it is unequivocal that the presence of bacteria is necessary for such conversion.¹² It is, however, clear that the bacterial biofilm, while necessary, is not sufficient for gingivitis to progress into periodontitis. Other factors, possibly related to the quality of an individual's immune response, are likely to be determinant factors in the conversion of gingivitis into periodontitis.¹³ Once the periodontitis process is initiated, it is known that the destruction of periodontal tissues is neither linear nor predictable. It is mostly agreed upon that tissue destruction in periodontitis occurs in random bursts of activity, which takes place during relatively short periods of time.¹⁴ The main disease-causing factors still remain elusive in the field of periodontology.

Attempts have been made, with limited success, to correlate periods of disease activity with microbiological indicators and the measurement of host-derived enzymes and other products.¹⁵ Of all parameters evaluated, bleeding upon probing is an excellent negative predictor of periodontal disease activity (i.e., its absence very well predicts lack of periodontal tissue destruction), but an overly sensitive positive predictor of periodontal attachment loss.¹⁵ Yet, bleeding on probing is the standard of clinical science when it comes to risk factors associated with future tissue breakdown,

despite the fact that its adoption as a predictor of periodontal tissue destruction leads to overtreatment. The periodontal scientific and clinical communities lack a more specific predictor, or combination of predictors, of periodontal disease activity.

It is currently accepted that analyzing multiple possible predictors of periodontal disease activity works better than examining each predictor individually.¹³ Therefore, this is an area of clinical periodontal practice where saliva could serve as an important and convenient vehicle to simultaneously evaluate a multitude of factors that could predict the bursts of activity known to occur in the progression of periodontitis. With this objective in mind, a chairside saliva test administered by the dental professional could play a very important role in determining which patient and what specific sites are in need of periodontal therapy so that the tissue destruction process is prevented or arrested.

Salivary Diagnostics

Studies reveal a promising outlook for saliva as a key diagnostic medium for determining systemic diseases or health statuses of individuals.¹⁶ Because

collecting saliva involves noninvasive methods and because it is an abundant and easily accessible biofluid, saliva is attractive for diagnostic purposes due to its highly enriched content of disease biomarkers that can be deciphered and analyzed. Biomarkers for the detection of specific diseases, such as Sjögren's syndrome, pancreatic, breast and oral cancer, or periodontal diseases can be detected in saliva.¹⁷⁻²¹ These properties of saliva open doors to a perfect method of exploring health and disease surveillance in clinical settings with just a minute amount of the oral fluid.

Current Salivary Diagnostic Tests for Periodontal Diseases

There are currently two salivary diagnostic tests available on the U.S. market for the detection of periodontal diseases.²² These tests enable clinicians to collect saliva and send samples to a laboratory where DNA-polymerase chain reaction analysis is used to complete the diagnostic tests and devise comprehensive risk-assessment reports. One test identifies the type and concentration of specific periodontal pathogenic microorganisms in patients'

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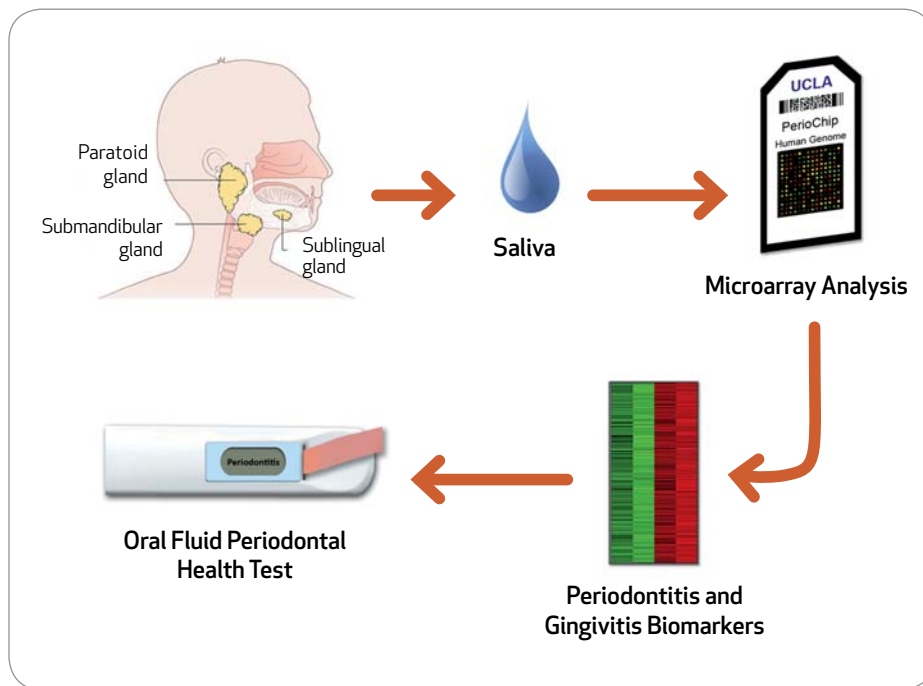


FIGURE 3. Salivary biomarker discovery by transcriptomic high-throughput technologies. mRNA is isolated from saliva. Transcriptomes of healthy and patients with periodontal diseases are profiled by a microarray. Disease-specific (gingivitis and periodontitis) and significant biomarkers are found and validated. The oral fluid periodontal health test uses combination of validated markers to analyze and display the patient's periodontal status.³¹

saliva samples. The laboratory report provides the clinician with pathogenic properties of the detected pathogen(s), which allows the clinician to determine the most appropriate antimicrobial therapy, and therefore, the ability to customize a treatment plan. Another salivary test claims to detect genetic susceptibility to periodontitis in individuals, which allows the clinician to identify patients who are at a greater risk for the development of severe periodontal destruction. The test analyzes genetic variation in individuals that affects the production of the inflammatory cytokines interleukin-1 α and β ; therefore, the test detects the patient's ability to over-express such molecules within his/her inflammatory responses.²² Both salivary tests state that they can potentially detect the periodontal diseases early and evaluate the susceptibility to periodontitis in individuals. Although the tests claim to be quick and easily administered at

chairside, four to five days are required for the laboratory results to be returned to the clinician. These tests identify general risk factors for the development of periodontitis, but lack the ability to determine when periodontal destruction will occur, thereby not being able to specifically predict periods of disease activity.

A novel salivary occult blood test (SOBT), which has been proposed as a periodontal status screening method, is currently available in Japan.²³ This method has been reported to detect individuals with poor periodontal health, which is defined as bleeding on probing in ≥ 20 percent of teeth or the presence of probing pocket depth ≥ 6 mm plus bleeding on probing in ≥ 1 tooth. A proprietary paper strip containing gold-labeled anti-human hemoglobin monoclonal antibody is dipped into the saliva sample. Upon forming an immune complex with hemoglobin, the immune complex

travels up the paper strip by capillary action until it is immobilized. This results in a magenta line, indicating a positive test result for the manufacturer's reference concentration of ≥ 2 $\mu\text{g/ml}$ human hemoglobin. A study of 1,998 subjects in a suburb of the Fukuoka metropolitan area in southern Japan reported that sensitivity and specificity of the SOBT in screening for poor periodontal status were 0.72 and 0.52, respectively.²³ The investigators involved in this study suggested that these values were not very high. However, SOBT can be utilized as a simple screening method at a low cost for identifying periodontal status of patients and increasing their oral health awareness.

The salivary diagnostic tests mentioned above claim to detect periodontal diseases based on purely microbial or single inflammatory-based information. They could be labeled as first-generation tests involving saliva in the diagnosis and prognosis of patients with periodontal diseases, and they represent the beginning of an era where disease-associated agents are detected and analyzed in saliva. William V. Giannobile, DDS, MS, DMSc, and co-workers are leading the field by combining microbial biomarkers from periodontal pathogens and salivary biomarkers from host-response changes to better understand the multifactorial nature of periodontal diseases.^{24,25} Because the existing tests do not allow for a direct correlation between the presence of specific bacteria and isolated inflammatory markers with the predictive value of periodontal attachment and bone loss, the next generation of salivary tests is presumed to be enhanced by enabling the understanding of these relationships in the diagnosis and prognosis of periodontal diseases.

Future of Periodontal Diseases Diagnosis Using Saliva

Even though the diagnostic value of saliva has been recognized and several potential biomarkers of periodontal diseases identified, most of the work conducted to date came short of providing clinically reliable and useful information for practitioners in terms of developing a more precise periodontal diagnosis and subsequent treatment planning.²⁶⁻²⁸ Three major challenges to current periodontal disease diagnosis using saliva are:

- The current tests are based on a small number of potential biomarkers;
- The tests are not “true” real-time assessments; and
- The tests are heavily based on general microbial and inflammatory cytokines that may or may not be disease-specific.

In order for the salivary diagnostics for periodontal diseases to be clinically relevant, the appropriate bioinformatics have to augment biomarker discovery so that validated biomarkers have disease discriminatory power. The test also needs to be real time, where the patient's periodontal status can be immediately evaluated while he/she is in the dental office. Lastly, biomarkers should not only diagnose the disease but also predict the risk of future disease activity by simple and affordable means.

Recent advances in transcriptomic high-throughput technologies are shedding new light on salivary biomarker discovery, which can elevate salivary diagnosis of periodontal diseases to a higher level. The salivary transcriptome refers to a collection of transcripts, DNA that is transcribed into RNA, within saliva. By analyzing the transcriptome, one can assess which genes are turned on or off and if there is a difference in gene expression between saliva from healthy and periodontal diseased patients. David Wong, DMD,

DMS, and his team at the University of California, Los Angeles, School of Dentistry believe that biomarkers found in saliva may actually predict bursts of periodontal disease activity (**FIGURE 3**). They are in the process of discovering gene signatures in patients by performing multiplex transcriptomic analysis of messenger RNA (mRNA) in human saliva (healthy vs. gingivitis vs. periodontitis). The basis for this investigation in the field of periodontal diseases is derived from a similar approach that has been successfully applied to the detection of cancer-associated biomarkers in saliva.

In fact, it has been proved that saliva contains discriminatory mRNAs in oral cancer. Using high-density oligonucleotide microarrays (54,000 probe sets representing approximately 38,500 genes), saliva mRNAs from healthy and oral cancer patients have been thoroughly profiled and statistically compared. They discovered four mRNA biomarkers for oral cancer with a sensitivity of 91 percent and specificity of 91 percent to distinguish cancer from the normal.^{29,30} The same discovery platform can be used to profile healthy and periodontal transcriptomes and to find the most significant candidate genes for the onset and progression of periodontal diseases. Those discriminatory candidate genes must be validated for their sensitivity and specificity as saliva biomarkers.

In addition to technological advances, in order for salivary biomarkers for periodontal diseases to have the intended clinical context, study design and clinical trials must reflect the ultimate goal of obtaining approval from the Food and Drug Administration (FDA). Recently, the FDA approved the oral fluid-based HIV antibody test. This milestone achievement in salivary diagnostics proved that saliva can be a disease-discriminatory biofluid much like

the “gold-standard” serum. Secondly, it reminded the research community that the end goal of future salivary biomarker discovery is the application of novel treatment and therapeutics to the real world by translating the knowledge from the laboratory bench to a medical or dental setting. Thus, the study design and clinical trials for the biomarker discovery should minimize bias and maximize clinical relevance. Clinical trial design such as the Prospective Randomized Open Blinded End-point (PROBE) design maximizes similarity to standard clinical practice, makes the research results more easily applicable in routine dental settings and aids in the translation step of future biomarker discovery.

The main goals of mRNA salivary biomarker discovery by PROBE design would be:

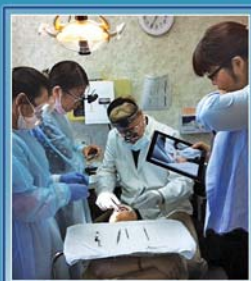
- To detect periodontal diseases early;
- To provide oral health professionals with an accurate chairside periodontal disease diagnostic and prognostic tool;
- To provide an easy self-test which the public can use in the comfort of the home; and
- To improve and encourage access to dental care and reduce health disparities across the U.S. and around the world.

In conclusion, periodontal disease diagnosis and follow-up care will greatly advance in the near future via the discovery of disease-specific salivary biomarkers. Prototype electrochemical devices such as the oral fluid periodontal health test at UCLA may provide accurate and real-time assessments of periodontal diseases for the general public either at home or at the dental office. Although challenges remain ahead, using saliva to gauge periodontal health appears bright for future application to aid in the diagnosis of periodontal diseases and the prediction of periodontal treatment outcomes. ■■■■

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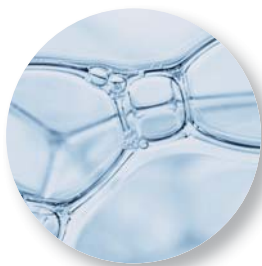
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Is Dentistry Going to Get into the Salivary Diagnostics Game or Watch from the Sidelines?

JED J. JACOBSON, DDS, MS, MPH

ABSTRACT What is salivary diagnostics and why should you care? Most of us dentists try to avoid or control saliva as it interferes with access, or chemical interactions in dental materials, or impression materials, or when it is simply a nuisance. Periodically, we may note reduced flow or encounter a patient with xerostomia. Correspondingly, we then manage the reduced flow in an attempt to maintain homeostasis. However, with the discovery of salivary biomarkers, saliva is taking on a new role.

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Conflict of Interest

Disclosure: None reported.

One only needs to observe how we are captivated by the science/technology in the movies or TV programs where one's DNA signature is left behind at a crime scene through fluids, including saliva. In the health care field, whether one is engaged in research or delivering health care services, the potential for salivary diagnostics is limited only by our imagination. This is illustrated by the fact that many of today's existing commercialized oral-based tests were yesterday's proposed ideas or concepts, captured in the 1993 New York Academy of Sciences Conference on oral-based diagnostics.¹ When coupled with the emerging point-of-care technology, the potential of salivary diagnostics is even more compelling.

In this section, I hope to elucidate for the reader the potential of salivary diagnostics for the dental profession and the patients we treat. My goal is to help the reader understand how the payer/insurance/consumer industry views salivary diagnostics and what obstacles must be overcome. The dental profession could be on the cutting edge of this new science/technology. And, if we are willing to embrace the potential uses, the profession could further cement itself as a cornerstone of primary health care. In my opinion, what will drive the inclusion of salivary diagnostics into every dental practice in the U.S., is the value proposition to the patient/consumer. So what is the value proposition? How could this disruptive technology serve the dentist and the patients they treat?

What must occur to facilitate the ongoing development and introduction of salivary diagnostics into the marketplace?

History

The use of salivary diagnostics dates back to the mid-1990s with the measurement of cortisol as a marker of stress. Some would argue it really began hundreds of years ago when kings used a simple oral saliva test to determine guilt or innocence. The accused was asked to swallow a handful of dry rice in a short period of time.² The assumption was that the guilty had a decreased salivary flow due to emotional stress and resulted in difficulty swallowing the rice. Much has occurred since the time of kings and the 1990s. The key development in this area of using salivary biomarkers is to match what one can attain with other fluids such as blood, urine and spinal fluid.³

The use of saliva is attractive to monitor parameters of health and disease not only because of saliva's diverse biologics, but also because it is noninvasive, easy to obtain, painless and there is no need to employ specially trained personnel for sample collection. The possibility to identify and measure biomarkers in saliva opens the avenue for diagnosis, early detection, screening, monitoring progression of disease, and compliance with treatment modalities.³ Salivary levels of the bacteria *Streptococcus mutans* and *Lactobacillus*⁴ correlated with cariogenic activity, whereas the presence of *Porphyromonas gingivalis* correlated with periodontitis.⁵ A salivary immunological assay for *Helicobacter pylori* has been developed to monitor patients suffering from gastric ulcers.⁶ Also, the detection of antibodies to hepatitis, HIV, Epstein-Barr, herpes and cytomegaloviruses in saliva has advanced detection of these viruses, especially in sites where drawing blood is difficult.

TABLE 1

Classes of Markers Found in Saliva and Potential Uses

Biomarker Class	Potential Applications
DNA	Standard genotyping Bacterial infection Head and neck cancer diagnosis Forensics
RNA	Viral/bacterial identification Oral cancer diagnosis
Proteins	Periodontitis diagnosis Cancer diagnosis Caries susceptibility
Mucins/glycoproteins	Head and neck cancer diagnosis Caries susceptibility
Immunoglobulins	Viral infection (HIV, hepatitis B and C)
Metabolites	Various endocrine conditions Stress, psychological status Periodontitis diagnosis Cystic fibrosis diagnosis
Drugs and their metabolites	Monitor drug abuse Monitor patient compliance to therapy
Viruses	Epstein-Barr virus reactivation (mononucleosis)
Bacteria	Oral cancer diagnosis Caries susceptibility
Cellular material	Head and neck cancer diagnosis

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Promising results for oral squamous cell carcinoma have been obtained through analysis of the salivary transcriptome and proteome.³ As stated previously, the concentration of steroids, cortisol, estradiol and progesterone in saliva has been used to monitor ovarian function, stress levels and Cushing's syndrome.⁷⁻⁸ Levels of C-reactive protein in saliva have been correlated to periodontal disease and cardiovascular disease.⁹ It is worth repeating that the advances in the field of protein/peptide characterization combined with the human genome databases has expanded the field of biomarker proteins or proteomics. Of great interest to the dental profession is the advance of proteomics in the

diagnosis of squamous cell carcinoma, an oral-pharyngeal cancer with grave and costly outcomes.¹⁰ The extent of biomarkers available in saliva can be seen in **TABLE 1** along with their potential uses. The presence of a wide array of biological markers such as proteins, glycoproteins, DNA, RNA, small molecule metabolites and messengers, drug metabolite byproducts, bacteria, viruses, exfoliated cells and antibodies demonstrate the promise that salivary diagnostics offers. Although dental caries, periodontal disease and oral cancer are the primary diseases the dental profession has significant responsibility to predict, screen, diagnose and ultimately treat, salivary biomarkers are being discovered

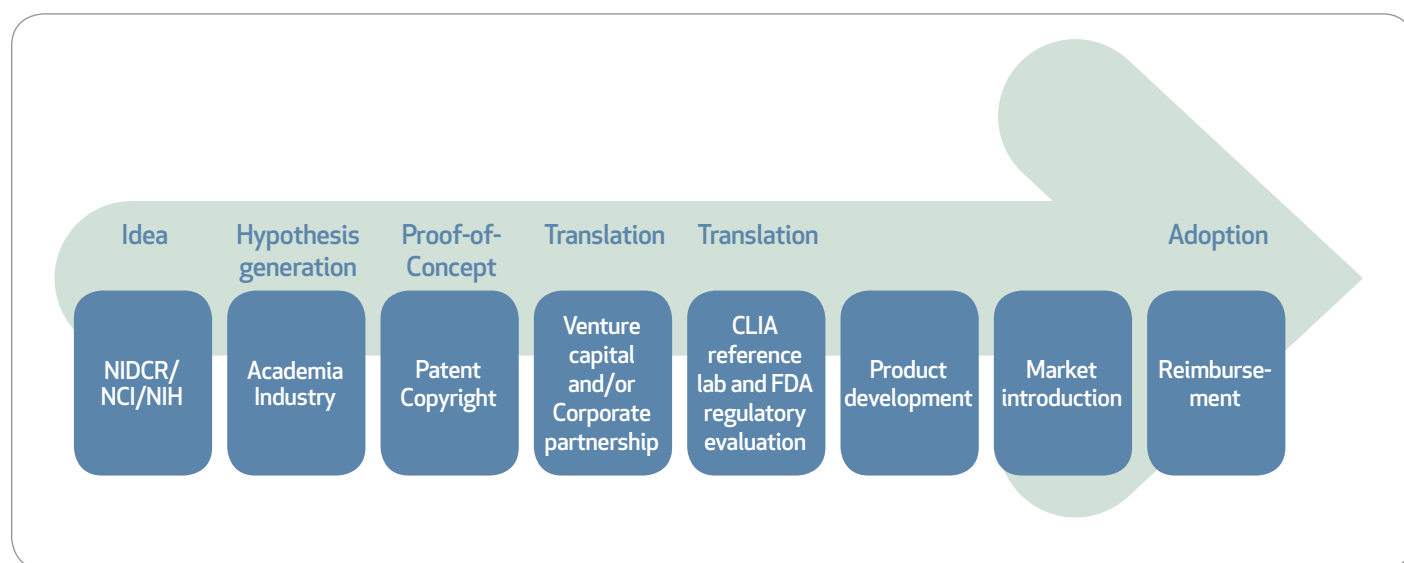


FIGURE 1. The usual or common path for a newly developed technology to enter the practice of dentistry.

for Sjögren's syndrome, diabetes, breast cancer, pancreatic cancer, lung cancer and Alzheimer's disease.¹¹ The possibility that a routine dental "check-up" could include a screening for an array of oral and systemic diseases from a droplet of saliva could position the dental office on the forefront of primary health care. What will need to occur to bring this technology to the dental office? The next section is an attempt to elucidate some of the essential elements necessary to bring salivary diagnostics into the practice of dentistry.

Commercialization of Salivary Diagnostics

FIGURE 1 represents the usual or common path for a newly developed technology to enter the practice of dentistry. Although the boxes depict distinct foci of activity that appear to occur in an organized formal successive series of steps, the reality is that there may be coincidental paralleling activities and actions that may loop back to previous events or leap frog ahead depending upon the product/service and regulatory steps. The process often begins with an idea, which leads to a hypothesis. As the idea/hypothesis moves

through the proof-of-concept phase — the phase often funded by the NIH, NSF, or NCI and academic institutions — non-academic, non-federally funded organizations will need to be engaged to advance the technology/science into a product or service. Often at this stage of development, the technology/proof-of-concept stage will lead to patent application and/or copyright. Corporate sponsorship or venture capital investments often are needed to reach and attain regulatory approval. Once the necessary regulatory approvals are attained, the product development moves into the market introduction phase. This may be the point in time when a dentist learns of the product. It is not unusual for a product to take five to 10 years from proof-of-concept to market introduction. Salivary biomarker diagnostics will likely progress within this time frame.

Some of the above steps merit further discussion given the unique features of salivary diagnostics (**FIGURE 1**).

Oral fluids present unique physical challenges such as viscosity of the fluid, inaccuracy of existing collection devices and the low concentration of analytes within the oral cavity. In addition, any test developed must also compare to existing

tests in blood and urine.

As each salivary diagnostic test is developed, it must also be reviewed by government bodies that permit new products to be sold. In the U.S., the Food and Drug Administration (FDA) is responsible for ensuring the safety and effectiveness of all medical devices. Any product must be reviewed by the FDA prior to being offered for commercial sale. Additionally, if the salivary biomarker requires the use of a medical laboratory, the processing of the fluid must meet clinical laboratory improvement amendments (CLIA) standards. There are a number of pathways taken by developers to demonstrate safety and efficacy.¹² Salivary diagnostics are in vitro diagnostic products (IVD) and are regulated based upon the relative risk/benefit to the patient, according to the claims the device manufacturer intends to make for the device and the degree of control necessary to ensure that the device is safe and effective. The level of FDA oversight prior to marketing is determined by the risk classification of the device. Class I devices are generally considered low risk, and many are exempt from pre-market reviews.

Class II devices are considered to

carry moderate risk, and are reviewed for substantial equivalence to legally market products (predicates) that have clearance for the same intended use by the pre-market notification or 510(k) process. Class III devices are considered high-risk devices that have no established predicates, or there is a high risk to the patient based on the results generated by the device, or where little is known about the analyte(s)/biomarker(s) detected by the device. These devices are subject to pre-market approval application (PMA). Unlike class II devices, these devices must independently demonstrate safety and effectiveness with appropriate clinical and analytical performance data.

Analytical performance requirements vary depending on the biomarker, the technology, how results are reported (quantitative vs. qualitative, signature vs. individual markers) and the use setting (clinical labs vs. point-of-care). It is likely that salivary biomarker devices will be introduced through a clinical lab with an eye toward a dental office point-of-care product.

Since assay performance can be greatly influenced by pre-analytical factors, including methods for sample collection, handling, processing, transport and storage, pre-analytical requirements will need to be validated to ensure consistent sample quality and assay performance. This will be addressed later in the article.

The most crucial validation is the clinical performance. The focus is on diagnostic sensitivity (false positives) and specificity (false negatives) when truth ("gold standards") can be identified. These typically are expressed as percentages. The clinical performance will be thoroughly vetted through the FDA/CLIA approval process. Once the regulatory approval process is achieved, product development and market introduction can occur.

Coverage and Reimbursement

Diagnostic tests are an essential element of health care delivery. Diagnostic tests are designed to inform and guide decisions that influence the course of illness and costs. A growing body of evidence suggests that salivary diagnostics holds considerable promise as an alternative to traditional tests or an entirely new industry. As with other types of health services, decisions concerning insurance coverage and reimbursement for salivary diagnostics will turn on the value proposition this new

IT IS LIKELY
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technology can deliver. Of great significance will be the economic value proposition as measured by return on investment and on cost-effectiveness or cost benefit analyses the purchaser of health care will perform. A new technology does not necessarily have to have a return on investment or demonstrate cost-effectiveness. However, if salivary diagnostics can demonstrate effectiveness as well as or better than current products in the marketplace *and* have a demonstrated ROI and/or cost-effectiveness, the probability the consumer/purchaser will pay for the product/service rises significantly. What are the key considerations concerning the economic aspect of salivary diagnostics? The following issues are the salient features that should be addressed before a purchaser of oral health benefits will consider paying for salivary diagnostic tests.

Clinical and economic value for diagnostic tests can be established through evaluation criteria as below. These evaluation criteria are amended slightly from a contribution by James Crall, DDS, MS, ScD.³

- Feasibility (technical) of the dental office to produce consistent results;
- Diagnostic accuracy as defined by sensitivity (false positive), specificity (false negative) and positive and negative predictive values;
- Impact on diagnostic and therapeutic thinking and behavior of the dentist;
- Impact on patient outcomes (improved outcomes);
- Impact on society (cost-effectiveness, ROI).¹³

In this context, what does cost-effective mean to the dentist and to the patient? The intervention could be one of the following:

- Less costly and at least as effective as other diagnostics;
- More effective and more costly, with the added benefit worth the added costs;
- Less effective and less costly, with the added benefit of the alternative net worth the added cost; or
- Cost savings with an outcome equal to or better than that of the alternative.¹⁴

The purchasers of health care services range from the individual consumer/patient to health care insurance companies and governmental agencies, such as the Centers for Medicare and Medicaid Services. Each purchaser undergoes a decision-making process that ranges in transparency and can be viewed as a hurdle or a facilitator to the introduction and expansion of salivary diagnostics. The formal decision-making process within regulated agencies, such as insurance companies, will, more or less, have the following attributes or characteristics in common:

- Scientific validation
- Appropriate approvals obtained (e.g., FDA, CLIA)
- Quality controls established
- Regulation in place (e.g., Genetic Information Nondiscrimination Act or GINA)
- Financial analysis performed (e.g., cost-effectiveness, ROI)
- Consumer/provider education materials developed
- Administration of new product development (e.g., ADA CDT code)
- Acceptance by health professionals

Scientific validation and the FDA or CLIA approval process were briefly discussed previously. The regulatory process, such as GINA, merits a more extensive discussion and will follow. However, before we clarify the GINA regulations, some of the other attributes and characteristics from above need to be expanded. Often, the dental profession will play a key role in the regulation, administration and acceptance of a new product/service, such as salivary diagnostics. The ADA and specialty organizations will formally produce position papers or clinical guidelines that will facilitate the regulatory, educational and administrative ease of new products. Collectively, these activities greatly assist in the acceptance of new products within the health profession.

Quality controls are often an essential feature of the FDA and CLIA approval process. Additionally, quality controls during the manufacturing, packaging and storage process can be significant. Thus, independent audits or reviews, such as ISO certification or UL approval, can aid the decision maker with regard to purchasing or including a new product as a benefit in a health plan.

Given the fact that many of the salivary biomarkers being developed

collect genetic information, it is critical to present an overview of the Genetic Information Nondiscrimination Act. GINA essentially prohibits health insurers and employers from using genetic information to discriminate against an employee or health plan member.

Title I of GINA is germane to dentists and dental insurance companies collecting salivary genetic biomarkers for purposes of benefit coverage and treatment decisions. The bill defines a genetic test as “an analysis of human DNA, RNA,

THERE IS A MOVE AWAY
from central laboratory
facilities to point-of-care
locations, such as outpatient
treatment facilities and even
home-based tests.

chromosomes, proteins or metabolites that detects genotypes, mutations or chromosomal changes (source Public Law 110-343).” GINA protects only predictive genetic information, not a test that relates to a disease affecting an individual, such as a manifestation of the disease that could be reasonably detected by a health care professional.

In the context of the discussion of using salivary diagnostics, GINA allows insurance companies to cover the cost of salivary genetic biomarkers and to use genetic information to make payment determinations, such as extra cleanings for individuals at increased risk for periodontal disease. The insurer must treat the group uniformly, use the minimum amount of information necessary and cannot use the information

for underwriting purposes. Additionally, an insurer may collect genetic information for research purposes, as long as it follows the usual patient informed consent and human subjects institutional review board (IRB) approval.

Once the scientific, regulatory, economic and education/communication elements are addressed, the dental profession will turn its attention to the administration of a health benefit that includes salivary diagnostics. Successful implementation of a new diagnostic benefit will depend greatly upon administrative ease. Health care insurers pay for tests performed in laboratories that meet standards certified under the Clinical Laboratory Improvement Amendments (CLIA) of 1988, according to Current Procedural Terminology (CPT) codes and ADA CDT codes. Although ADA CDT codes exist that could be used to administer a salivary diagnostic benefit, there may need to be specific references to salivary biomarker diagnostics.

The field of diagnostic testing is shifting the location of where testing is conducted. With the technology today, there is a move away from central laboratory facilities to point-of-care locations, such as outpatient treatment facilities and even home-based tests. Home pregnancy tests and glucose monitoring are but two examples of this shift. The extension to the dental office is within our grasp.

Due to a significant investment by the National Institute of Dental and Craniofacial Research (NIDCR) in salivary diagnostic technology development and salivary proteome research, considerable progress has been made over the past decade. Paralleling efforts in the development of practical products, such as handheld salivary biomarker detectors

TABLE 1

Salivary Diagnostic Applications

- Infectious agents
- Disease
 - Local
 - Systemic
- Hormone levels
- Therapeutic drug monitoring
- Drugs of abuse
- Forensic applications

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that can be used in the office by dentists or other health care providers for point-of-care disease screening and detection, have occurred. Such devices may soon be available for dental offices. Given that the scientific, regulatory, health policy, value proposition, administration and acceptance by third-party payers of salivary diagnostic may be very imminent, would this “nontraditional” approach be accepted by the dental profession? And, how could salivary diagnostics be used in the practice of dentistry?

Salivary Diagnostics in the Dental Office

Salivary diagnostic applications fall into several broad categories (TABLE 2). The obvious application is disease detection. While detection of dental caries and periodontal disease have been discussed in other sections, the capability of detecting systemic disorders from a droplet of saliva can engage the dental profession to a much deeper level. Historically, we have tried to gauge the overall health of our patients through a careful history and thorough oral exam and limited physical exam. Through salivary diagnostics, we can perform the health screening and evaluation of our patients to a greater degree of accuracy.

Systemic diseases, including infectious diseases such as HIV, hepatitis A virus (HAV), hepatitis B virus (HBV), hepatitis C virus (HCV) and autoimmune diseases, as well as endocrine disorders (diabetes), Alzheimer’s disease and several cancers have salivary biomarkers.¹⁵⁻¹⁷

Consequently, the dental office visit could be an opportunistic event, whereby the dental health care worker could screen for the above diseases.

Dentists and Oral Disease Detection and Screening for Systemic Diseases

Given that more than 60 percent of the U.S. population sees a dentist every year, the impact of dental offices not only screening for oral disease but systemic diseases that have identified biomarkers in saliva would be significant. The ability to detect previously undiagnosed pathology and intervene early in the patient’s disease progress would be greatly valued by all stakeholders in our patients’ health.

Disease monitoring of the existing patient population can yield many opportunities to catch potential oral and systemic diseases early in order to facilitate prevention and treatment. Effective reduction in morbidity, mortality and health care costs associated with diseases outside of the oral cavity, salivary diagnostics must be communicated to the patient’s physician. The dental office’s role is strictly screening and monitoring, not establishing a diagnosis. That will remain with the patient’s physician.

What evidence exists that dentists would include salivary diagnostics in screening for oral and systemic diseases? There are several signs that give one optimism about the ultimate inclusion of salivary diagnostics within a dental benefit program and the dental profession’s acceptance of this product/service within their practice. First, there is the emerging science of salivary diagnostics in a dental setting that is a direct result of the NIH/NIDCR initiative to fund research in salivary diagnostics. Further, the ADA and Delta Dental of Michigan have partnered to produce an educational video entitled

“Salivary Diagnostics: How Spit Can Save Your Life.” This video can be found at deltadentalmi.com/Wellness/Oral-Health-Resources/Oral-Health-Topics/Drool-is-Cool.aspx and ada.org. The primary focus of this video is to raise awareness among health professionals regarding salivary diagnostics. Even more encouraging is the evidence that dentists would be willing to perform salivary diagnostics.¹⁸ Although the survey may not completely reflect the attitudes of all dentists, knowing that nearly 90 percent of the responders gave a favorable reply to the question of whether they would be willing to perform salivary diagnostics is heartening.

As with any disruptive technology, there will be a wide spectrum of acceptance and behavioral change by the dental profession and the patients we treat. If the value proposition is self-evident and the necessary patient protections are in place, the opportunity to screen, diagnose and monitor for oral and systemic diseases via a droplet of saliva would have a significant positive impact on our patients, our profession and society. Will we get into the game or watch from the sidelines? ■■■■

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TIMOTHY G. GIROUX
DDS/BROKER

ASK THE BROKER

THIS COULD BE THE BEST TIME AND THE BEST YEAR TO SELL YOUR PRACTICE!

As a dental broker, of course, every year is the best year to list your practice! All kidding aside, most of us in the transition business saw a reduction of activity due to the economic downturn. Simple economics of supply and demand produced what one would expect...a slight increase in the values of practices as measured by the normal "rules of thumb". Unfortunately this increase in the multiple was offset by the fact that most dental practices' revenues were down during this period. Since the election is over and the world did not end on December 21st, the economy appears to be settling in for a slow growth period. Values and revenues have stabilized. Interest rates are still at historic lows and 100% financing is still available in most transitions.

So why is **NOW** a better time than usual to consider selling your practice?

1. **Inventory has been consistently low** for several years, therefore values are up. We do not expect this to continue as the "baby-boomers" are expected to retire in just a few short years.
2. **Interest rates are still at historic lows.** Financing is also readily available at 100% for most transitions. As the economy begins to improve, we expect interest rates to increase. Most financial analysts believe that inflation has to kick in at some point due to the printing presses running at the Fed.
3. **Normal trends and past experience has always** demonstrated an increase in activity for practice transitions in mid January. We usually experience an increase in calls from both buyers and sellers. Buyers have just made a New Year's resolution to get into their own practice. Sellers, based on their accountant's year-end advice, often decide it is time to "hang up the shingle".

The tax debate is over for the time being. Sellers will now pay a little more in taxes under the new rules. Generally this may equate to working about one month more to pay Uncle Sam as compared to the old rules. Smaller practices may not even be impacted. In the short run, I believe that future tax increases are more likely to take place than tax decreases. I also believe that the inventory and interest rates will start to inch higher in the near future. **Higher interest rates and more inventory will definitely put downward pressure on practice values.**

As a dentist first, I always finish my lectures stating that I do not believe sellers should "time the market". While taxes, interest rates, inventory and local market forces influence pricing, I believe that you should retire when you are ready to. If you are contemplating retirement in the near future, **NOW** is a good time to consider making the move!

Timothy G. Giroux, DDS is currently the Owner & Broker at **Western Practice Sales** (westernpracticesales.com) and a member of the nationally recognized dental organization, ADS Transitions. You may contact **Dr Giroux** at: wps@succeed.net or 800.641.4179



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A look into the latest dental and general technology on the market.

iPad mini (Apple Inc., \$329) Apple has taken the iPad experience and shrunk it down to a 7.9-inch screen and a \$329 entry price point. Available in both white and black, the design of the iPad mini bears much resemblance to the appearance of the iPhone 5. Users will immediately notice how incredibly light and thin it is. Among the best features of the iPad mini are its size and weight. In addition to having a smaller screen, the iPad mini is just 0.28 inches thick and weighs 0.68 lbs. Instead of having symmetrical bezels, the iPad mini has thinner bezels on two sides, allowing it to fit comfortably in either one or two hands. The iPad mini is intelligent enough to know when users are touching the screen or holding it on the sides. It is packed with features found on the regular iPad such as a FaceTime HD camera, a 5MP iSight camera, the ability to record 1080p video, the new Lightning connector and a 10-hour battery life. Having the same screen resolution and processor as the iPad 2, Apple has introduced a fully featured tablet into a small package. All apps made for the iPad 2 work well on the iPad mini. Users may notice the lack of a Retina Display (high-resolution technology) when compared side-by-side with the new iPad. However, when viewed on its own, the lower resolution of the iPad mini display is not an encumbrance. With its thin and light profile, users will find the iPad mini very portable and easy to carry. It can easily fit in a purse or a large coat pocket. The iPad mini contains stereo speakers, the first for the iPad line of tablets, which provide dual-channel sound, but because of its low profile, the iPad mini delivers only average sound fidelity. Siri, the personal digital assistant, is also included. Press and hold the home button to ask Siri anything from sports scores to finding restaurants (requires Internet connection). The iPad mini is every bit an iPad, except it is mini.

Anatomy & Physiology Revealed (Exprima Media, \$49.99 for full version, \$12.99 for single-module version) Cadaver dissection has been an invaluable tool for students learning to identify parts of the human body. However, outside the lab, students are limited in the amount of resources that can be referenced. *Anatomy & Physiology Revealed* for the iPad takes the concept of a textbook and makes it interactive. The complete version, which costs \$49.99 from the iTunes App Store, contains a full complement of modules for different systems of the body. A single-module version also is available for \$12.99. (The full version is a better value because the individual modules of the basic version cost significantly more when added up.) Each module has four categories to choose from: Dissection, Histology, Imaging and Videos. The latter three contain typical slides and educational videos, which are in most textbooks that include companion digital media. The true gem is the Dissection category, which takes advantage of the iPad's touch screen. A list of structures is available to view and interact with. With a two-finger swipe, layers of anatomy are peeled away, revealing the tissue underneath all the way down to the skeletal bones. Each layer has its own identifiable structures that can be located using the "Dissect" button. Each structure contains both an audio pronunciation of its name and text descriptions of its purpose or function. The dissection feature truly distinguishes itself from a textbook by making it interactive. Note taking and quizzes also are built in. While this app has amazing interactive features, it has untapped potential. Users are unable to rotate or zoom in on images, for example, but *Anatomy & Physiology Revealed* for the iPad is an amazing tool for the price. The textbook, interactive components and a powerful way to take notes make it a valuable portable solution.



CardMunch — Business Card Reader (LinkedIn, free) For the business professional who attends conferences, mixers, meetings and other social events on a regular basis, collecting business cards can be cumbersome. CardMunch streamlines the process of collecting contact information from business cards by allowing users to snap a photo of the card and save the phone numbers, email addresses and business addresses onto their iPhone, iPod or iPad (the app is only available for iOS). Contact information is saved into the CardMunch app and is categorized by last name. There is a lag time that varies between two and 10 minutes (sometimes longer) from the time the photo is taken to when the information shows up. Because CardMunch is a LinkedIn app, users must have an account with the company. The contact information on business cards is matched with that person's LinkedIn photo and the app pulls work experience, education, skills and other information listed on the person's personal LinkedIn account. Users also can send invitations to connect on LinkedIn and send emails through the app. The process is simple, but there are a few hiccups. The app will close if a user tries to add the contacts to an iPhone database unless the phone is told to allow CardMunch to save these contacts. This can be done by going to settings, privacy, contacts, and clicking CardMunch to "on." Other problems users have expressed concern over include unexpected crashing and the inability to edit contact information once it is uploaded. Also, within the app, contacts can only be categorized by last name and there is no way to add contacts to other accounts such as Gmail. The variance in the amount of time it takes for contact information to show up after a photo of a business card is taken can be frustrating as well. All things considered, however, CardMunch provides a handy alternative to lugging around a Rolodex of business cards and remembering to put them in the right spot after a conference or meeting. With this app, users don't necessarily need to hang on to a person's business card; they would simply be able to hand it back to them after taking the photo. Overall, this is a useful app for those looking to jettison that stack of business cards sitting on their desks and the functionality with LinkedIn is a positive.

CamCard Lite (IntSig Information Co., Ltd., free, \$2.99 for full version) This app is used to pull information from business cards and store on a mobile device. Available for iOS and Android, the free version allows registered users to save 50 cards initially and three per week thereafter. Non-registered users can save 20 cards initially and two per week thereafter. Named "Apple App Store 2011 Rewind Top Business App" and updated on Sept. 24, 2012, CamCard stores contact information in the "card holder" within the app, but also lets users save information to the device's system contacts, Gmail or other accounts. Scanning a business card is quick and so is the process of storing. The only problem is sometimes the app fails to scan properly on the first try. After a photo is scanned, however, the app crops out the background behind the business card in the photo and places the image directly into the contact database. The app also features email recognition, anti-shake photo shooting, auto-detect text orientation and auto-rotate card images. Users also can pull photos already stored in the mobile device to input contacts. CamCard lets users send single and mass SMS texts, email and invite contacts to connect on LinkedIn. Also included in the app is an option to add notes to each individual contact. The "introduction" feature lets users send contact information to other contacts — or "introduce" contacts to one another. Also featured is the ability to edit contact information, something other card reader apps do not always provide. For the international travelers, CamCard can read 12 different languages, including English, French, Spanish, Portuguese, German, Italian, Dutch, Swedish, Finnish, Danish, Norwegian and Hungarian. When first signing in, the app asks to send push notifications, alerts, sounds and icon badges and asks to access contacts currently listed in the mobile device's database — all of this can be denied by the user. Aside from a few small glitches, CamCard is a reliable option for those looking to make the switch from paper to digital in terms of business contacts. The ability to edit contacts, built-in communication options and a relatively quick scanner provide a very user-friendly experience.

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\$388,000, Endodontic Practice in the Bay Area, Northern California with four (4) operatories, sterilization/lab combo, staff lounge, business office, private office, PBS Endo software, Kodak digital radiography with two (2) sensors and two (2) Zeiss microscopes. Contact our office for more information.

\$709,000 - General Dentistry Practice in Coastal Orange County, Southern California, with four (4) operatories, fully equipped. Great location near shopping center. Modern, beautifully appointed office with high end finishes. Must see! Call our office for more information.

PRICE REDUCTION - \$95,000 - Leasehold Improvements in Pasadena, Los Angeles County, Southern California with six (6) Adec Chairs/Lights in a great part of town. Contact our office for more information.

NEW LISTING - PRICE TBD - General Dentistry Practice in the San Gabriel Valley, Los Angeles County, Southern California. Call our office for more information.

\$998,000 - General Dentistry Practice in Downey, Los Angeles County, Southern California, with fourteen (14) operatories, 1 large sterilization room, 1 small sterilization room, reception room, staff lounge, private office, business office, 2 storage rooms, and 2 consultation rooms all located in a free-standing building near shopping and freeway. Contact our office for more information. **IN ESCROW.**

PRICE REDUCTION - \$245,000 - General Dentistry Practice in Palm Springs, Riverside County, Southern California with four (4) operatories. This practice is located on a main street, and has been established since 2005. Seller is moving out of the area. This is a PPO/Fee For Service practice, no HMO.

\$545,000 - Amalgam-free General Dentistry Practice in Westwood, Los Angeles County, Southern California with five (5) operatories, includes equipment, wet lab, consultation/seminar room, sterilization room. Doctor retiring. Great location across from UCLA campus in a professional building.

\$450,000 - General Dentistry Practice in the South Bay, Los Angeles County, Southern California, with four (4) operatories, sterilization room, adjustment lab, reception room, staff lounge, private office, and consultation room. This practice is fully digital and paperless. Contact our office for more information. **IN ESCROW.**

PRICE REDUCTION - \$395,000 - Prosthodontic Practice in Walnut Creek, Contra Costa County, Northern California with three (3) operatories, fully equipped, two-desk laboratory, administrative office, and private office near a retirement community. Doctor retiring, 28 years in the same location.

\$275,000 - Perio Practice in Coastal Orange County, Southern California with five (5) operatories, lab, sterilization area, business office, private office in a professional building. Great location. Seller is retiring with 33 years of goodwill. Call our office for more information. **IN ESCROW.**

PRICE REDUCTION - \$300,000 - General Dentistry Practice in Los Alamitos, Orange County, Southern California with seven (7) operatories, sterilization room, wet lab, business office, private office, staff lounge. Located on a busy street with plenty of frontage.

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LOS ANGELES COUNTY

BURBANK (Ortho) - 45 yrs of gdwill. Consists of 2 chairs in open bay w/ Pano/Ceph in 1,221 sqft suite. Proj. ~\$330K for 2012. ID #4047.
BELLFLOWER (Pract. & Bldg) - Long established practice w/ 5 eq ops in a single story bldg. Some HMO. Corner location ID #4197.
CULVER CITY - Leasehold & Equip Only! 10 eq op office in a single story bld. In residential area. Heavy traffic flow. ID #4261.
HUNTINGTON PARK (GP) Established in 2008. In a 2 story free stranding bldg near residential area. Has 4 eq ops. ID#4295.
LA PUENTE (GP) - 5 eq op office located in single story bldg. Seller open to sell bldg. Great starter office with great visibility ID #4253.
LONG BEACH (Ortho) - 46 yrs of goodwill. Located in a 3 story medical bldg. 4 chairs in open bay. In residential area. ID # 4255.
LONG BEACH (Ortho) - Three practices as one entity. Have approx. 300 active patients. Has over 50 yrs of goodwill. ID#4285.
N. HOLLYWOOD (GP/ORTHO) -Over 14 years of goodwill located in Prof. Bldg. Consists of 4 ops. Monthly revenues ~\$32K. ID#4265.
RESEDA (GP) Coner location w/ excellent signage. With 17 yrs of goodwill this practice has 5 eq ops and 1 plmbd not eq. ID#4175.
WHITTIER - Estab. in 1955. Large state-of-the-art off. located in a single story strip mall. Net \$484K. Mo. revenues of \$127K. ID #4259.

ORANGE COUNTY

FOOTHILL RANCH - Modern contemporary designed office w/ 6 fully eq ops. Established in 2006. Mo. revenues of \$34K. ID #4209.
LADERA RANCH (Ortho) - Beautiful state-of-the-art office w/ 5 eq chairs in open bay. Established in 1978. ID #4209. **SOLD**
LAGUNA HILLS - General practice located in 2 story busy shopping center. 19 yrs gdwill. 4 eq. ops. NET OF \$230K. ID # 4155.
LAKE FOREST (GP) - Turn key practice w/ 3 spacious eq ops, 1 plmbd not eq in a 1,200 sq ft ste. Busy shopping center. ID #4123.
RANCHO STA MARGARITA (GP) State of the art office in 2 story plaza center. Has 7 fully eq ops. NET \$242K. ID #4187.
SAN JUAN CAPISTRANO - Equip & Charts! Modern designed practice w/ 3 fully eq. ops. in a 1,113 sq. ft. suite. ID #3071
SANTA ANA - Leasehold & Equip Only! Well designed practice consists of 4 eq ops in multi story med bldg. Excellent lease. ID #4221.
TUSTIN - Leasehold & Equip Only! Beautiful state-of-the-art off. Great for GP or Spec. 5 eq ops/3 plmbd not eq for expansion. ID #4225.
TUSTIN - Leasehold & Equip Only! Great office located in a busy shopping center with heavy traffic flow. 3 eq ops. ID # 4273.

RIVERSIDE / SAN BERNARDINO COUNTIES

APPLE VALLEY (GP) - Established in 2007 this modern designed office is in a busy shopping center. Net of \$384K. ID #4271.
BARSTOW(GP) - Long established office w/ 4 eq ops in a single story bldg. Easy freeway access. Fee for service. ID #4241
LA QUINTA - Price Reduced. Leasehold & Equip Only! Located in strip shopping center W/ 3 eq. ops, 1,000 sq. ft. ste.ID#4063
MURRIETA (GP) - Beautiful office w/ 3 eq ops surrounded by major anchor tenants. Some Capitation. 4 day/wk office. ID #4247
RIVERSIDE (GP) - Established in January 2012 in busy shopping center. 4 fully eq ops. In residential area. Heavy traffic flow. ID #4269.
SUN CITY (GP) -Long established office w/ 2 eq ops, 1 plumbed not eq room for expansion in a 4 suite medical/dental bldg. ID #4287.
WRIGHTWOOD (GP) - 21 years of goodwill. Only dentist in town. Fee for service. Consists of 4 eq ops. ID #4243. **SOLD**

SAN DIEGO COUNTY

SAN MARCOS - Leasehold & Equip Only! Modern designed offic. Established in 2007. Consists of 2 eq ops in 800sqft ste. ID #4217.
SAN DIEGO (GP) - In free standing bldg w/ private prkng. Consists of 5 ops w/ Dentrux software. Monthly revenues of ~\$40K. ID #4279.

VENTURA & KERN COUNTY

PORT HUENEME (GP) - Absentee Owner Practice. Established in 1980. Consists of 3 eq. ops, in a 920 sq. ft. suite. ID #4167. **SOLD**
THOUSAND OAKS (GP) - Modern designed off. w/ 6 eq ops. Seller owns bldg/ not for sale. 50 yrs of goodwill. Absentee owner. #4257.

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How to Place a Free Classified Ad

The *Journal* has changed its classified advertising policy for CDA members to place free classified ads online and publish in the *Journal*. Only CDA members can place classified ads. Non-CDA members can place display ads.

All classified ads must be submitted through cda.org/classifieds. Fill out the blank fields provided, including whether the ad is to appear online only or online and in the *Journal*. Click "post" to submit your ad in its final form. The ad will post immediately on cda.org and will remain for 90 days. Space permitting, your ad will run one time in the next issue of the *Journal* following the posting of your online ad. After 90 days, you will need to repost your ad if you wish to continue running it online.

Classified ads for publication in the *Journal* must be submitted by the fifth of every month, prior to the month of publication. Example: Jan. 5 at 5 p.m. is the deadline for the February issue of the *Journal*. If the fifth falls on a weekend or holiday, then the deadline will be 5 p.m. the following workday. After the deadline closes, classified ads for the *Journal* will not be accepted, altered or canceled. Deadlines are firm.

Classified advertisements categories are: Equipment for Sale, Offices for Sale, Offices for Rent or Lease, Available Positions, Opportunities Wanted, and Practices for Sale.

How to Place a Display Ad

Non-members are welcome to place display ads. For information on display advertising, please contact Corey Gerhard at 916-554-5304 or corey.gerhard@cda.org.

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Dental office for lease, great location in Bakersfield. Corner lot, 5 ops fully equipped, 2,300 sq. ft., 27 parking spaces. All you have to do is just move in, any questions call 661-444-0442.

OFFICES FOR RENT OR LEASE —

This is a great opportunity to sublease 2 operatories in our spacious 5 op office. Great location just off the 5 Frwy. in Irvine. The office is in a three-story medical building. The operatories are plumbed and ready to add your chairs, your patients, units and x-ray heads. There is plenty of

room for your supplies. We have a spacious front desk area and beautiful reception area. Great for someone looking to cut overhead. Email us at russellcannondds@earthlink.net; check out our office at www.DrRussellCannon.com; please call us at 949-552-7874.

OFFICE FOR RENT OR LEASE — Stunning views from 17th floor of 27-story building. Full-time use of two of four operatories. Shared waiting room, lab and break room. Separate private office, business desk and sterilization/storage. Recently redecorated common areas. Located in densely populated business/residential district with 3 adjacent recently completed large

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residence complexes. Easy parking. Price based on usage. Email rjelicich@dslextreame.com or call 323-804-1650.

OFFICE FOR RENT OR LEASE —

Rare opportunity for dental specialist in Orange County. Build-to-suit Dental Suite(s) available for lease (1,650 - 3,300 sq. ft.). Located at 26730 Towne Centre Drive, Foothill Ranch, 92610. Excellent dental referral tenant mix in centrally located retail district. Strong geographic demand for new practitioners. Call 949-724-5562 or email aaron.phillips@colliers.com

OFFICE FOR RENT OR LEASE —

Established dental office. Four plumbed opertories. Newly remodeled. Quiet room. 1,000 sq. ft. Tremendous amount of underserved young families in the area.

Perfect for pediatric dentist, endodontist or oral surgeon. \$1,250 a month. Please call 661-871-0780.

BEAUTIFUL BEVERLY HILLS OFFICE —

Have 1 to 3 operatories for rent. Days/terms flexible. I have space to share in prime location on Bedford Drive. OK for recent grad starting out or well established practice slowing down. Specialists welcome contact Dr. Steven Goldy at smgdds@aol.com or 310-550-1511.

OFFICE FOR RENT OR LEASE — Located at 15080 7th Street, Victorville, CA 92395. 1,750 sq. ft. in shopping center; 25-year Dental Practice, 5 Operatories, 1 Lab/Office, ADA-compliant bathroom, reception, plumbing and electrical in place. Please call 415-576-9999 to inquire.

OFFICE FOR RENT OR LEASE —

Located in 450 Sutter above Union Square, this 3-operator office is currently available 1 to 3 days. One operator is unused. Easy access for patients, 450 Sutter is home to many specialists and supporting labs. Please email or call the office if interested. Email bobvivamandaalexis@mac.com or call Nancy at 415-391-6660.

OFFICE FOR RENT OR LEASE —

Dental suite for lease, available 3/13. 1044 SE, 3 ops, fully built out, including nitrous plumbing and cabinetry, with sunny patio. At 3321 Mission Drive, in Santa Cruz, next to Dominican Hospital. Contact Tom Young at drtom@tomyoungdds.com

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UCSF School of Dentistry Clinic Director Position

The University of California, San Francisco, School of Dentistry seeks applicants for a full time Clinic Director position. This is a non-tenure-track position in the Predoctoral Clinic. This is one of two Clinic Director positions working under the direction and leadership of the Associate Dean of Clinical Affairs.

The Clinic Director shares responsibility for management of all patient care within the Predoctoral Clinics including developing patient care policies and procedures; providing student education; participating in the assignment and reassignment of patients within the program; handling and resolving patient complaints; and reviewing patient records to assess quality of care. The Clinic Director collaborates with the Division Chairs, Course Directors, faculty and other Administrative Team members in the implementation of policy and procedures.

Candidates must possess good clinical skills, dental knowledge, and ability to effectively communicate verbally and in writing. The Clinic Director will be required to provide clinical supervision one day per week in which he/she is expected to oversee the clinical activity in the Predoctoral dental clinics. The Clinic Director will participate one half day per week in an intramural faculty practice.

Candidates must have an active DDS or DMD degree. Interested applicants should submit a cover letter and a complete curriculum vitae to: <http://ucsfhr.ucsf.edu/careers/> Key word: Dental Job Requisition 37707BR



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BAY AREA

AC-085 SAN FRANCISCO: Long established. 2nd floor. 1,433 sf overlooking Park Presidio. 4 large ops. Skylights/large windows **\$189k**

AG-125 SAN FRANCISCO: Relaxed schedule (weekends only) Professional building, major thoroughfare, highly desirable area. 1,000 sf w/2 ops. Plumbed for 1 add'l **\$125k**

B-9851 SAN RAMON Facility: This opportunity will not wait! Office ~ 1,700sf w/ 3+ ops **\$219k**

BG-106 UNION CITY Facility: Open floor plan. 1,800sf w/ 6 fully equipped ops. New Computers and New Telephone Systems **\$150k**

BN-130 OAKLAND: Large successful FFS practice, in a multi-story Prof. Building. ~ 2,200sf w/ 4 ops **\$1.4m**

CC-056 MARIN CO: Beautiful garden setting. Near popular shopping center. Easy access to Hwy 101. 1200sf w/ 3 ops. Room for 2 add'l **\$350k**

CC-077 BENICIA: Highly visible. Within walking distance of downtown. 820 sf w/2 ops **\$125k**

CC-109 PETALUMA: Priced for quick sale! Reasonable overhead & below market rent. 2 ops. Plumbed for 3 add'l **\$170k**

CC-118 VACAVILLE Facility: Highly visible, easily accessible. Ample parking. Growing city. 859 sf w/3 ops. Lease/Purchase option on suite **\$245k**

CC-133 SANTA ROSA: Stable patient base. Well-respected. Location = new patient traffic. Excellent signage/major thoroughfare. 1,291 sf w/3 ops + 1 add'l **\$480k**

D-9091 ATHERTON: Turnkey operation 969 sf & 3 ops **Call for Details!**

DC-113 MILPITAS: Seller retiring! Great location 1,009 sf w/ 3 ops. Plumbed for 1 add'l **\$140k**

DC-122 CUPERTINO: Rare Opportunity! Well-respected, fee-for-service/cash practice. *Opportunity to own property in near future. Highly desirable commercial corridor.* 1,075 sf w/ 3 fully equipped ops. Plumbed for 1 add'l **\$889k**

DG-107 MOUNTAIN VIEW Facility: ~ 3 mi. from Google HQ. \$400k+ in build-outs. Top-of-the-line, state-of-the-art, Sirona Eq w/ built-in intra-oral cameras & curing light units. 1,800 sf w/3 ops. Plumbed for 1 add'l **REDUCED! Now only \$245k & seller will pay TWO MONTHS RENT!**

BAY AREA CONTINUED

DG-124 MILPITAS: Highly visible 2-story building. Desirable area. 960 sf w/ 2 ops + 1 add'l **\$130k**

DG-116 SALINAS AREA: Large, loyal, stable diverse patient base. Popular Retail Center. 1,400 sf w/5ops. State-of-the-art Equipment **\$245k**

DG-138 MONTEREY: Centrally located in "New Monterey". Charming office. Excellent street exposure! 1200 sf w/ 4 ops **\$680k**

DN-063 SAN JOSE: Long-established, Popular Retail Shopping Center. 780 sf w/ 2 ops **\$70k**

DN-084 PALO ALTO Facility: Drawing from an educated, upper middle class community. "Move-in" ready! 700 sf w/3 ops **\$125k**

DN-099 SAN JOSE Facility: Ultra-modern facility. Well-established. Dental Professional Complex. 1,450 sf w/5 fully equipped ops **\$99k**

DN-112 SAN JOSE: Fee-for-service ~1008 sf with 2 ops and plumbed for 2 add'l **\$100k**

NORTHERN CALIFORNIA

E-8641 SACRAMENTO Facility: 2,100+ sf w/ 3 ops & plumbed for 1 add'l **\$50k**

EN-026 ROSEVILLE: Warm Caring Environment, ~1000sf, w/3 ops **\$380k**

EN-114 ANTELOPE Facility: Great Location! "Move-in-ready" with 4 ops + 1 add'l **\$120k**

F-1013 FORTUNA: Well respected FFS GP. Loyal stable patient base. 1,000 sf w/ 3 ops **\$195k**

FN-087 LAKE COUNTY: Quality practice w/ friendly staff! ~2400 sf w/ 3+ ops **\$775k**

FN-088 SISKIYOU CO: Family Friendly Location. ~1300 sf w/ 2 ops **\$85k /Real Estate: TBD**

G-883 CHICO AREA: Quality FFS GP. Attractive Prof Plaza. 1,990 sf w/ 5 ops **\$495k**

G-998 CHICO/PARADISE: Breathtaking natural beauty! ~898sf, 3 ops **Now \$240k**

GN-058 YUBA CITY: Known for quality dental care & patient comfort, 1704 sf w/ 4 ops **\$450k**

GN-103 CHICO: Successful, highly esteemed practice! ~3500 sf w/ 8 ops + 2 add'l **\$850k**

GN-134 REDDING: Stellar reputation, quality care and location! ~2,264sf w/4 ops. **\$500k**

HN-059 LASSEN CO: Quality, well-established, family-oriented. 1600 sf w/3 ops **\$120k**

CENTRAL VALLEY

I-1005 SAN JOAQUIN VALLEY: Long-established High-End . 2500+ sf w/ 6 ops **\$650k**

I-9721 STOCKTON: Prof. complex . 1,450 sf w/ 3 ops & plumbed for 1 add'l **\$75k**

IG-067 STOCKTON: Fully computerized, paperless, digitalized. 5000 sf w/ 10 ops **\$475k**

J-1000 TULARE: Highly visible location! ~1650 sf w/ 4 ops **Practice: \$465k /Real Estate: \$249k**

J-1001 LINDSEY: All American City! Conveniently located ~3380 sf w/ 5 ops **\$220k**

JG-137 FRESNO: Own the Building too! Stable Patient Base! ~3500 sf w/ 5 ops **Call for details!**

SOUTHERN CALIFORNIA

KF-070 BREA: Modern & attractive. Near restaurants, shopping & entertainment.. 2400 sf w/ 2 ops. Plumbing/cabinets for 3 add'l **\$350k**

SPECIALTY PRACTICES

AC-119 MILL VALLEY Prosthodontics: Near downtown. Recently remodeled! State-of-the-art equipment including: digital charting and x-ray. 1,100 sf w/ 3 ops. Plumbed for 4th **\$450k**

AG-096 PACIFICA Orthodontics: Easy accessibility, solid referral base. Perfect opportunity for merger/secondary office. 1,400 sf w/5 chairs **\$178k**

CG-105 VACAVILLE Orthodontics: Strong, loyal, wide-spread referral base. 30+ pats/day. 5-6 new starts/mo. 2,000 sf - 4 chairs/bays **\$280k**

EG-131 ROSEVILLE/AUBURN Orthodontics: 2 practices within ½ hour of each other! Call for all the details on both locations! Priced at only **\$175k**

G-975 CHICO Orthodontics: Denti-Cal patient base. ~ 900 sf w/ 2 + ops . **\$90k**

GN-117 SACRAMENTO/NORTH VALLEY Endodontics: Highly esteemed, Fee-for-Service. Setting the bar for others! ~2000 sf w/3ops **\$310k**

I-7861 CENTRAL VALLEY Orthodontics: 2000 sf, open bay w/ 8 chairs. Fee-for-Service. 60-70 patients/day. Professional Plaza **\$370k**

I-9461 CENTRAL VALLEY Orthodontics: ~ 1650 sf w/5 chairs/bays & plumbed for 2 add'l **\$180k**

CLASSIFIEDS, CONTINUED FROM 138



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OFFICE FOR RENT OR LEASE —

City of Torrance-750 to 7,000 sq. ft. space available. Central Torrance location with great visibility, signage and parking. Only one block from Little Company of Mary Hospital. Densely populated with PPO ins. Patients. In a class "A" building, lease rates and terms are negotiable and improvement allowance is available. Free rent concession with long-term lease. Must see! Email rocio@rootvisionendo.com or call Rosie at 310-710-2890.

OFFICE FOR RENT OR LEASE —

City of Montebello – 1,104 sq. ft., medical/dental suite located at the corner of 6th/Beverly Blvd., close to the 10 and 60 freeways, has a suite available for rent in a newly remodeled building. great visibility and signage w/ plenty of patient parking. Great location, w/in walking distance from the Beverly Hospital. Densely populated Hispanic community and lots of PPO/indemnity insurances in the area. Landlord will help generously with tenant improvements to build a brand new suite to fit your needs upon layout approval. Rental rate is

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- **BISHOP:** For Sale-General Dentistry Practice & Building. After 29 years in the same location this retiring dentist is selling both his practice and building. Collections were \$1,000,243 in 2011 with \$387,000 adjusted net income. There are 6 days of hygiene in this 5 op., 1,800 sq. ft. building. 100% financing available for both building and practice. Owner has reduced price below valuation price. #14390
- **CHICO:** For Sale-General Dentistry Practice. The collections in 2011 were \$1,209,207. There are 7 days of hygiene in this 5 op., 2,400 sq. ft. office. Equipment includes Laser, Intra-Oral Camera, new Cone Beam X-ray and Dentrix software. This excellent practice has 1,824 active patients with 12 new patients a month. Owner will consider an Associate to Buy-In position leading to the purchase of this practice. #14392
- **FRESNO:** For Sale-General Dentistry Practice: \$935K in collections in 2011, w/adjusted net income of \$337K. Office is 2,300 sq. ft. and is located in north Fresno in a highly visible professional office complex on a main thoroughfare. There are 6 equipped operatories, owner reports average age of equipment is 4 years. Practice has been operating in present location for over 20 years. Eaglesoft software, owner is retiring. #CA502
- **GRASS VALLEY:** For Sale-General Dentistry Practice. Gross Receipts of \$491K with an adjusted net income of \$130K. Overhead 73%. Office leased 1,555 sq. ft., 4 equipped operatories, 5 available. Laser, Intra-oral Camera, Cerec, & Eaglesoft Software. Owner would like to retire. #14379
- **GRASS VALLEY:** For Sale-General Dentistry Practice. GR 545K 3 days/wk (4 avail), 3 hygiene days/week. 5 Ops (6 Avail) 1,950 sq. ft. Refers out most/all Ortho, Perio, Endo, Surgery. Office has Laser, Intraoral Camera, Pano, & Dentrix Software. Owner retiring. #14372.
- **GRASS VALLEY:** For Sale-General Dentistry Practice. Owner relocating. 2011 gross receipts \$505K on 4 days per week with 5 days of hygiene. This well-established practice with approximately 1,300 active patients is located in an 1,100 sq. ft. office with 4 ops, Dentrix software, Panoramic X-ray, Cerec, Intra-oral Camera, and X-rays in all ops. #CA509
- **GRASS VALLEY:** For Sale-General Dentistry Practice. Owner retiring. Well-designed 1,550 sq. ft. office with 4 ops plumbed, 3 ops furnished. Gross Receipts for 2011 were \$309K on easy 3 days/wk with low (47+%) overhead. Practice refers out Endo, Perio, Surgery & Ortho. Pano, PBS software. May be able to merge with another existing practice that will also be for sale in the near future. This merger would result in \$800,000 gross annually. #CA503
- **GREATER CHICO/YUBA CITY:** For Sale-General Dentistry Practice. 2011 GR \$592,520 on 4 days. 1,200 sq. ft. office with 4 equipped ops. Intra-Oral Camera, Pano, 1,100+ patients. Owner retiring after 33+ years in this picturesque and prosperous community with abundant recreation, close to the mountains and near one of the largest lakes in N. CA. #14359
- **HAWAII (MAUI):** For Sale-General dentistry practice. Gross Receipts of \$636K. Office has four equipped operatories in 1198 sq. ft. Pano, Laser, I.O. Camera, Fiber Optics, 2 ½ days of hygiene. Owner retiring: Don't miss this opportunity to live and work in paradise. #20101
- **HAYWARD:** For Sale-General Dentistry Practice. This practice consists of 1,600 sq ft with 4 treatment rooms in an excellent location. 2010 Gross was \$501,000 with a \$228K adjusted net income. Dental Vision software, Average age of equipment is 8 yrs. Approximately 1,200 active patients.
- **LANCASTER:** For Sale-General Dentistry Practice. This 4 operator office is located in 2,360 Sq Ft on the second floor of an attractive Medical Dental office building. Gross receipts were \$676,000 with a \$174K adjusted net income. Dentist is retiring after 39 years. 4 days of hygiene. Additional operatories could be added to existing space. Great location. #14376.
- **LAS VEGAS:** For Sale-General Dentistry Practice. This 4 operator practice is in a great location in a high-end professional building with a view of the city of Las Vegas. It is equipped with an Intra-oral camera, Pano, Laser, and Dentrix software. There are 2 days of hygiene. The staff is well trained to efficiently run this low overhead office with great potential for further growth, 2011 gross receipts were \$727K with adj. net income of \$331K. Doctor moving out of state. #NV500
- **LEMOORE/HANFORD AREA:** For Sale-General Dentistry Practice & Building. Owner has worked in this location since 1971. Gross Receipts were \$378K with \$139K adj. net income. There are 3 equipped operatories and 3 days of hygiene. Purchase of the building is optional to the Buyer. 100% financing is available for both building and practice. Excellent opportunity for new grad or satellite practice. #14375.
- **MERCED:** For Sale-General Dentistry Practice. This is a tastefully done, 4 op., 1,550 sq. ft. office with 4 and 1/2 days of hygiene/week. All equipment is less than 10 years old and includes 2 Lasers, Intra-oral Camera, Panoramic X-ray, Digital X-rays, and Dentrix Software. Molar endo and involved oral surgery cases referred out. Basic general (non-amalgam) type dentistry. 2011 gross was \$878,000 with 4 weeks out as a result of a medical issue. 2010 collections were \$956,000. Excellent location. Seller retiring. #CA512
- **MILLBRAE:** For Sale-General Dentistry Practice. This beautiful, well-established office is located on the main thoroughfare of the North Peninsula, offering great exposure that generates 25-30 new patients per month. 5 treatment rooms (6th plumbed) in approx. 1,500 sq. ft. equipped with Digital Pan, Digital Imaging and Intra-Oral Camera. 2011 gross receipts of \$651,000 with \$230,000 adjusted net income. Owner is retiring. Don't delay, this won't last long! #14395
- **MODESTO AREA:** For Sale-General Dentistry Practice. Owner is a senior partner in a practice set up to share expenses and reduce overhead. Each partner has their own patients, operatories, etc. Selling partner's gross receipts in 2011 were over \$950,000 with only 54% overhead or \$443,777 adj. net income. There are 8 days of hygiene. Intra-oral camera, Panoramic X-ray, digital X-rays, and Dentrix software. Owner is retiring. #CA506
- **MODESTO-TRACY-AREA:** For Sale-Pediatric Practice. \$677,000 in collections in 2010 with a \$357,000 net income. This 3-chair office is located in approximately 1,250 sq. ft. & has recently been remodeled. Patient Base software. Office equipped for NO2 & IV sedation. Practice has operated in its present location for 20 years.
- **MOUNTAIN VIEW:** For Sale-General Dentistry Practice: This 2 day per week satellite office is located the heart of Silicon Valley, surrounded by most of Mountain View's largest employers. 2 fully equipped treatment rooms (expandable to 4), Pano, Digital Processor and Dentrix Software in approx. 1500 sq. ft. With household names as your neighbors, few opportunities are this good! #14398
- **ORINDA:** For Sale-FACILITY SALE. If you are thinking about relocating or building out a new office in a prime location, then you need to look at this opportunity. At half the cost or less, you can have an outstanding, fully furnished, 3 operator office (2 additional plumbed) in a great location with good parking in an upscale building. Pictures and a complete list of equipment and furnishings are available. Office is suitable for Endo, Oral Surgery, or General Dentistry. #CA508
- **REDDING:** For Sale-General Dentistry Practice. Owner retiring. 2011 GR of \$548K on 4 day, 30 hr week schedule. Well-established practice in well-designed, 5 op. office, with 6 days of hygiene. Intra-Oral Camera and Dentrix. #CA514
- **SACRAMENTO:** For Sale-General Dentistry Practice. **Ideal start-up or satellite practice.** This is a satellite practice of the owner, this is a 5 op. office that includes Intra-oral camera, Panoramic X-ray, and Soft Dent software. 2011 gross receipts were \$202,000. Average age of equipment is 5 to 10 years. Purchase price is far less than purchasing equipment and paying for leasehold improvements in a new location. This office also comes with approximately 450 active patients that provides an immediate cash flow. #CA507
- **SACRAMENTO:** For Sale-General Dentistry Practice. Gross Receipts \$546K with adjusted net income of \$159K. Office is 2,400 sq ft with 7 operatories. Practice has been operating in the same location for the past 50 years. Pano, Softdent software. Owner to retire. #14374
- **SAN JOSE:** For Sale - FACILITY SALE ONLY - NO PATIENTS: Exclusive Willow Glen district offering 4 fully equipped treatments rooms, 2 additional plumbed, in approximately 1,900 sq. ft.. Digital Scanner, Intra-Oral Camera in a very elegant setting. This facility only sale offers favorable lease terms as well. #CA504
- **SAN RAMON:** For Sale-FACILITY SALE. Great San Ramon location in professional complex: equipment, leaseholds & furnishings only. 1,400 sq. ft. with 4 equip. treatment rooms (2 additional plumbed), Pano X-ray, Computer Server & Workstations w/Dentrix, Intra-oral Camera & wired for digital. Priced to sell in an upscale community that's home to Chevron, AT&T, Robert Half International, Accenture and Safeway Stores. #CA511
- **VICTORVILLE:** For Sale - General Dentistry Practice. This practice is worked just on a three day a week schedule. There are 3 operatories with 10 off-street parking spaces. Practice has high visibility. The practice was acquired from previous owner in 2002. #14393

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OFFICES FOR SALE

OFFICE FOR SALE — Vacant land is available to build dental/medical office building in the city of La Habra, CA, in Orange County. Please email contact information to vipcpa@verizon.net.

OFFICE FOR SALE — I am moving to a new office and I am selling the old office with all equipment in place. It's in a beautiful building—you will have to sign a lease. The equipment is older but well maintained and

looks great. 4 operatories, 2 X-rays, sterilizer, office equipment, copiers, printers, computers, furniture, stools, vacuum, air, etc. A complete office up and functioning. Just bring in your supplies and handpieces and go to work. The cost is \$30,000. If you are interested please call 818-889-5367 (day) or 805-373-6630 (evenings).

OFFICE FOR SALE — Once in a lifetime opportunity... Beautiful turnkey dental office for sale. Approximately 1,500 sq. ft. All equipment and supplies. Great location, building and neighborhood. Ready to sell. Asking price below appraisal. Current owner has a new business and no longer needs office. Great for General or Specialty. Email hansen.brenda@sbcglobal.net — only serious inquires please.

PRACTICES FOR SALE

DENTAL PRACTICE FOR SALE —

Location in rural Northeast California. Five-year old equipment, newly remodeled office, 4 ops, PANO, Nobel Biocare Implant System. 3d/wk hygiene. Collected \$764K in 2010 on 5d/wk, \$527K in 2011 on 3d/wk. Great all-Christian staff. Reasonable rent. Asking \$175K. Please contact via email at ddspractice4sale@yahoo.com.

DENTAL PRACTICE FOR SALE —

Promising practice for sale in Buena Park, CA; 3 ops equipped and 2 ops elec+plumb ready. Very modern design and decor. Well-equipped and turnkey practice. Great location. Low overhead. Open only 4 days a

CONTINUES ON 144

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3085 STANISLAUS COUNTY GP

General, family practitioner now retiring. Offering well-est. successful, state-of-the-art practice in approx. 2,800 sq. ft. facility w/7 fully-equipped ops. Great location & exceptional long term staff. Owner willing to help in transition. Estimated 2,500+ active pts. 5 year avg. GR \$1.4M w/net of approx. \$500K & just 3.5 doctor days & 10 hyg. days/wk. This practice is for an established dentist or 2 dentists w/experience & who will appreciate a high quality practice. Asking \$895K.

3090 PACIFICA GP

Seller retiring from well est., well-run, coast side practice. Located a block from the beach with rolling hillsides in a charming community just 20 minutes from SF. Approx. 1,400 active pts., 4 doctor-days/wk, 6 hygiene days/wk. & 13-15 new pts./month. Avg. GR for past 3 years \$473K. Seller willing to help for smooth transition. Asking \$313K.

3080 SAN BENITO COUNTY GP

State-of-the-art family practice. 1,558 sq. ft. facility. Approx. 1,100 active pts. 3 Dr. days. 2011 GR \$449K+. Asking \$305K.

3078 GILROY DENTAL FACILITY

1,280 sq. ft. turn-key dental facility w/5 ops in medical/professional office complex adjacent retirement community near Westwood Shopping Center. Great opportunity to establish a practice with little start-up cost or open a satellite office. Asking \$75K.

3089 GILROY GP

Seller retiring from well-est. high quality practice w/approx. 1,200 active pts. 2011 GR \$513K+ w/3.5 doctor days/wk. 5 fully-equipped ops in 1,440 sq. ft. modern facility. Seasoned and dedicated staff providing a relaxed atmosphere to loyal pt. base. Asking \$350K.

3082 SONOMA COUNTY GP

Well-established, family-oriented practice in charming community located in the hub of Sonoma County. Stable patient base. 4 doctor days, 3 hygiene days/week. Approx. 14 new pts./month. Approx. 1,500 active pts. 3 fully-equipped ops., recently upgraded equipment, in 900 sq. ft. state-of-the-art office. 2011 GR \$552K+. Asking \$384K.

3083 SONOMA COUNTY GP & BLDG

Well established & respected GP known for personalized, quality dental care in a family oriented community. 2011 GR \$767K+ w/4 doctor days. Seller retiring & willing to help for smooth transition. Asking for practice \$560K. Building is also available for purchase.

3086 SONOMA COUNTY GP

Seller retiring after 30 years of practice located in highly desirable suburban area. Excellent reputation with local community and relationship with large, stable patient base of approx. 1,400, avg. 15 new pts./month. State-of-the art fully-equipped practice w/pano, laser, intra-oral camera, Dentrrix. 2011 GR \$1.1M+, 2012 on schedule for \$1.2M. Asking \$828K.

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CLASSIFIEDS, CONTINUED FROM 142

week and \$340K+collection in 2012. Email with any questions to drsuh@hotmail.com.

DENTAL PRACTICE FOR SALE —

Certified Orthodontist is needed to take over practice immediately in the Santa Clarita Valley, CA area. Owner is willing to have Certified Orthodontist take over current practice and patients. Three options of space available to continue practice with current going lease rate in great family community. Please email resume to azbinc@sbcglobal.

DENTAL PRACTICE FOR SALE —

Promising practice for sale in Tracy. 4 ops, one of which is a pedo room with awesome kid's decor. Well-equipped. Dual vacuum and compressor. Digital X-ray,

pano, ceph. Lab is well equipped as well. Great strip mall location. Lots of walk-ins. Email dentalofficeforsaleintracy@gmail.com for more information.

DENTAL PRACTICE FOR SALE — San Diego practice for sale: 5 ops, strip business complex, near 805 and 8 freeway, three days per week, 40 years of goodwill, \$750K last year collection, owner very motivated. Email to tinro12@yahoo

DENTAL EQUIPMENT FOR SALE**DENTAL EQUIPMENT FOR SALE**

— DentalEz vacuum two 1 hp motors, \$1,195. Adec priority 1005 blue dental patient chair (matching stools available), needs minor repair, \$ 995 Matching stools

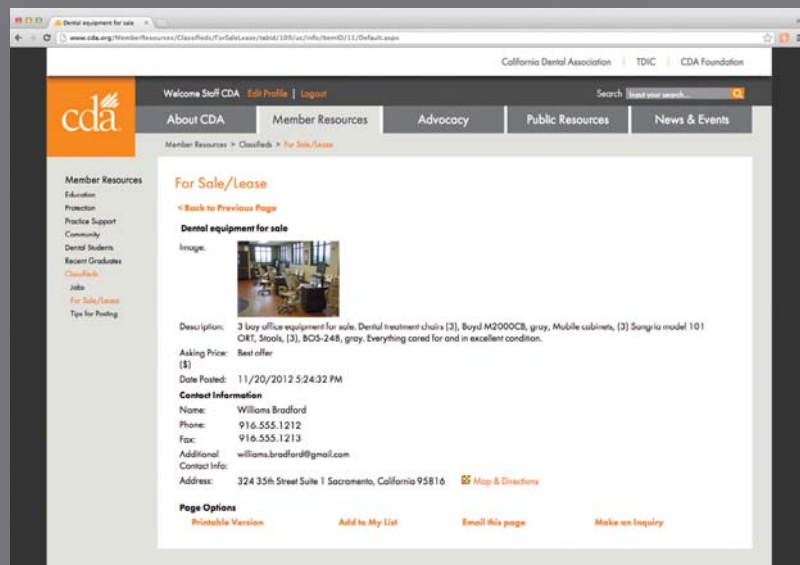
(2) to Priority dental chair \$250. Adec wall mount duo Dr and Assist dental delivery units (2), \$1,395 each. (3) Adec Doctor carts (3)2 have ivory-colored tops and third is walnut, \$695 each. Densply dental curing lights wired (2), \$149 each. Cameron Miller electrosurgery unit, \$350. Danville air abrasion unit with powerboost, \$695. Buffalo bead sterilizer, \$75. Dental stools, forest green, (4), \$125 each. Dental stools, mixed colors, (4) \$50 each. Green fabric reception chairs (5). Large bookcase for pvt office, \$150 Hon metal vertical files lockable (2), \$125 each. Photos available for all items. Feel free to make offer. Email jef1@sbcglobal.net or call 559-438-0121 office, 549-269-4313 cell.

CONTINUES ON 146

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- 6008 MENDOCINO COAST - FORT BRAGG** Cultural haven offers attractive lifestyle. 2011 collected \$725,000 on Owner 3-day week. 4-days of Hygiene. Digital radiography. Computers in ops.
- 6020 PEDO PRACTICE - ATTRACTIVE FAMILY COMMUNITY** 2012 trending \$550,000+ in collections with Available Profits of \$280,000+. Remarkable office with inventory here topping \$345,000. Computerized charting with digital Pano and Ceph. Full price \$240,000.
- 6025 CENTRAL MARIN COUNTY - SAN ANSELMO** Well established practice collected \$490,000 in 2011 on 3-day week. 2+ days of Hygiene.
- 6026 SACRAMENTO** 2011 collected \$825,000 on 3-day week. Practice coupled with facility and location to grow more. Bring in specialists. Strong foundation can be developed into busier practice.
- 6029 NORTHEAST CALIFORNIA - ALTURAS** Trade in smog and congestion for soaring mountains and close-knit communities. 2012 tracking \$600,000 on 3-day week. 3+ days of Hygiene. Strong Recall. Great staff. Beautiful office. 3-ops with Adec delivery systems. Be busy, be happy and take vacations. No worries here. Full price \$185,000.
- 6030 SANTA ROSA AREA** 2012 tracking \$850,000+ in collections, reflecting growth over 2011. Strong profits. 4-days of Hygiene per week. Digital x-rays. Building optional purchase.
- 6031 MODESTO** Owner retiring. 2011 tracking \$430,000 in collections. 4-ops. Bilingual staff.
- 6032 MODESTO** Currently collecting \$520,000+ with Available Profits of \$210,000. 3-days of Hygiene.
- 6034 SAN LEANDRO AREA** Did \$650,000 in 2011. Owner reduced time in 2012. Shall collect \$475,000. 5-ops. Nice Hygiene schedule. Great blue collar practice.
- 6035 SAN FRANCISCO'S EAST BAY – ORTHO** Part-time practice grossing \$350,000 per year. Very desirable location.
- 6036 SAN JOSE'S 827 BLOSSOM HILL ROAD - FACILITY ONLY** Highly coveted address. Complex 100% occupied. Phenomenal access per proximity to intersection of Almaden Expressway & Blossom Hill Road, and right off Highway 85 and Guadalupe Expressway. 5 equipped Ops in attractive 1,500 sq.ft. suite. Digital radiography.
- 6037 SAN FRANCISCO'S UNION SQUARE** Optimum opportunity for Dentist seeking high-end Downtown SF practice. 5-days of Hygiene. Collected \$750,000+ with Available Profits of \$325,000+. Great views.

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- 3294 ARVIN – LAMONT** Grossing \$20-to-\$40,000/mth on 2-days. 5-Ops in 2,800 sq.ft. suite. Has enough HMO to pay for building and practice. FP for Building & Practice \$350,000. Make Offer.
- 3296 PALM SPRINGS** High identity 2,500 sq.ft. building. 6 Ops. Grossing \$1.2 Million. Prestigious practice in prestigious location. FP \$1.55 Million for building & practice.
- 3297 PALM DESERT** High visibility Shopping Center Practice across freeway from 5,000 senior citizens. 4-ops. Within 18 months can be built to Million Dollar status. FP \$660,000.
- 3298 BALDWIN PARK** Conservative Lady Dentist grossing \$250,000. 3-ops in 1,000 sq.ft. suite. Great visibility. FP for Practice and Building \$750,000.
- 3299 NORTH SAN DIEGO COUNTY BEACH CITY** Owner does no-hands on dentistry. Topped \$1+ Million in past. Now apprx \$800,000/year. Hands-on Owner could take over \$1 Million bar. Building available for \$1.6 Million. FP for practice \$550,000.
- 3300 FULLERTON - FREE STANDING DENTAL BUILDING ON MAJOR BLVD - BANK OWNED** Previously grossed \$660,000+. Buyer let great manager go. PPS has new great manager. Grosses apprx \$15-to-\$20,000/mth. 6 Ops plumbed & 4 equipped. All Offers tendered to Bank.
- 3301 CUCAMONGA & MONTCLAIR - TWO ALMOST IDENTICAL PRACTICES** 5 & 6 Ops with each positioned to exceed \$80,000/mth first year. Both offices state-of-art with reasonable rent. MONTCLAIR ASKING \$750,000. CUCAMONGA ASKING \$900,000.
- 3303 REDLANDS** Apprx 1,500 sq.ft. in busy plaza near freeway off ramp. 5 Ops with state-of-art equipment. Previous gross approx \$500,000. FP \$250,000.
- 3304 HEMET** Seller works 2-day, grosses apprx \$600,000. Full time Successor can gross \$1.5 Million. 8 op office in high identity "WESTERN DENTAL" type location. FP \$550,000.
- 3305 ONTARIO** Stater Brothers Shopping Center. Grossing \$15,000-to-\$20,000/mth. Recently renovated. Averages 30+ new patients/mth. Should do \$500,000 with good Clinician. FP \$250,000.
- 3306 MISSION VIEJO - EMERGENCY SALE** Gorgeous office. Bank will assist right Buyer.
- 3307 RESEDA** Averages 60 new patients/mth! High identity location with electronic billboard. Gorgeous 7-op office. Will Gross close to \$1 Million. FP \$885,000.
- 3308 LANCASTER** Enjoys #1 position in PPO directory. Grossing \$400,000+. Seller likes to golf. Seller's Manager says: "Find motivated Successor. Practice should do \$1 Million." Manager has proven track record of building practices. FP \$350,000.
- 3309 FOLLOW THE MONEY - TAKE HOME \$500,000 PER YEAR!** Gold Mine in exquisite ski & recreational area. 100,000+ people in winter, 30,000-to-50,000 people in summer with 12,000 year round patients with great insurance. Grosses apprx \$1 Million with Profits of \$500,000. Seller will take \$775,000. TAKE CONTROL OF YOUR LIFE!

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Paul Maimone
Broker/Owner

ANTELOPE VALLEY – (7) op comput. G.P. in a free standing bldg. Newer eqt., digital X-rays. Annual Gross Collect \$1.5M. Cash/Ins/PPO pts. 20-30 new pts/mos. (50) yrs of Goodwill.

ANAHEIM #3 – (3) op comput. G.P. in a one story prof. bldg.. Gross Collect \$20K+/mos on 2 1/2 days/wk. Does no advertising. Cash/Ins/PPO pts. Low rent and overhead.

BAKERSFIELD #21 – (10) op comput. G.P. & Bldg. on main St. (3) ops fully eqt'd. (3) ops part eqt'd & (4) plumbed. Store front w exposure. Collects ~\$500K/yr. on 3 days/wk. Cash/Ins/PPO.

BAKERSFIELD #25 – 4 op comput. G.P. & free standing bldg. for sale. Cash/Ins/PPO pts. (3) days/wk of hygiene. Annual Gross Collections \$400K+. **NEW**

CENTRAL VALLEY/So. FRESNO COUNTY – (3) op comput. G.P. in smaller town w ltd. competition. Newer eqt. Networked & digital. Dentrix & Dexis. Gross Collect \$40K+/mos **NEW**

HACIENDA HTS #1 – (2) op G.P. Located in a shop ctr. Collect \$140K/yr p.t. **PENDING**

HACIENDA HTS #2 – (3) op comput. G.P. Cash/Ins/PPO. 2012 Project. Gross Collect \$525K+. (38) yrs of Goodwill. 4 1/2 days of Hygiene/wk. (10) new pts/mos. Seller retiring. **SOLD**

IRVINE – (3) op Turnkey office located in a shop. ctr. Newer equipment. Reasonable rent.

MAYWOOD/COMMERCE – (4) op computerized G.P. located in a very busy shopping center. Heavy foot traffic with many walk-ins. (20+) yrs of Goodwill. Cash/Ins/PPO pt. base w some kids Denti-Cal. Annual Gross Collections between \$400K - \$500K. Seller retiring. **NEW**

RESEDA #6 – (3) op comput G.P. located in a prof. bldg. Gross Collect. ~\$140K/yr p.t. Cash/Ins/PPO pts. Digital X-rays & Dentrix. Great starter or 2nd office. **PENDING**

SAN FERNANDO VALLEY ORTHO PRACTICE - UPCOMING – Check Back Soon.

SAN JOAQUIN VALLEY – G.P. & Bldg. in small town w ltd. competition. (4) op comput. office. Cash/Ins/PPO. Annual Gross Collect \$500K+. Very low overhead. Seller retiring. **NEW**

SANTA BARBARA #3 – (3) op comput. G.P. in a prof/med/dental bldg. Cash/Ins/PPO. 8-10 new pts/mos. Gross Collect. \$250K+ on a (4) day wk. Digital X-ray. Seller retiring. **PENDING**

VALENCIA – DROP DEAD GORGEOUS! – (6) op comput. G.P. Digital X-Rays & Pano. Dentrix and Dexis s/w. CEREC. All the toys and whistles. Newer build out and eqt. 2012 Projected Gross Collect. \$770K. 22+ years of Goodwill. Seller has a degenerative condition & is calling it quits before it worsens. Seller will assist with transition.

VISALIA – (4) op comput. G.P. and triplex bldg. for sale. Gross ~\$20K/mos. p.t. **NEW**

WESTLAKE VILLAGE – Gorgeous complete turnkey. No charts. Ready to see pts. **PENDING**

WEST SAN FERNANDO VALLEY PEDO/ORTHO OFFICE – Gross Collect \$600K+ **NEW**

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DENTAL EQUIPMENT FOR SALE

— Donate dental unit, chair and light for use in Guatemala hospital built by Children's Network International ("Help the Children"). Will pick up. Contact Dr. Norman Bitter at 559-431-2684 or email ncbdds@comcast.net.

DENTAL EQUIPMENT FOR SALE

— Most equipment is new to almost new. CE stuart fully gnathological articulator, model 73 with complete (and additional) sets of eminentia pads and side shifts \$ 2,000. 2 of SAM 2 articulators, \$ 900 each. Carrying case for SAM articulator, \$ 50. Additional incisal pin for SAM articulator (brand new), \$ 40. SAM transfer stand, \$ 150. MPI (mandibular position indicator) by SAM (brand new), \$ 700. Whip mix articulator model 8500, \$400. Pantograph by Waterpik, \$ 400 Pantograph carrying case, \$ 125. Prest-o-lite pneumatic devise by pneumadyne ins. 15 extra 12 g co2 cartridges included, \$200. Belmont low fusing metal 2 lb., \$ 100. Castix cast stabilization introductory kit \$ 25. Pictures can be emailed. Send requests to sooksonmc@gmail.com.

DENTAL EQUIPMENT FOR SALE

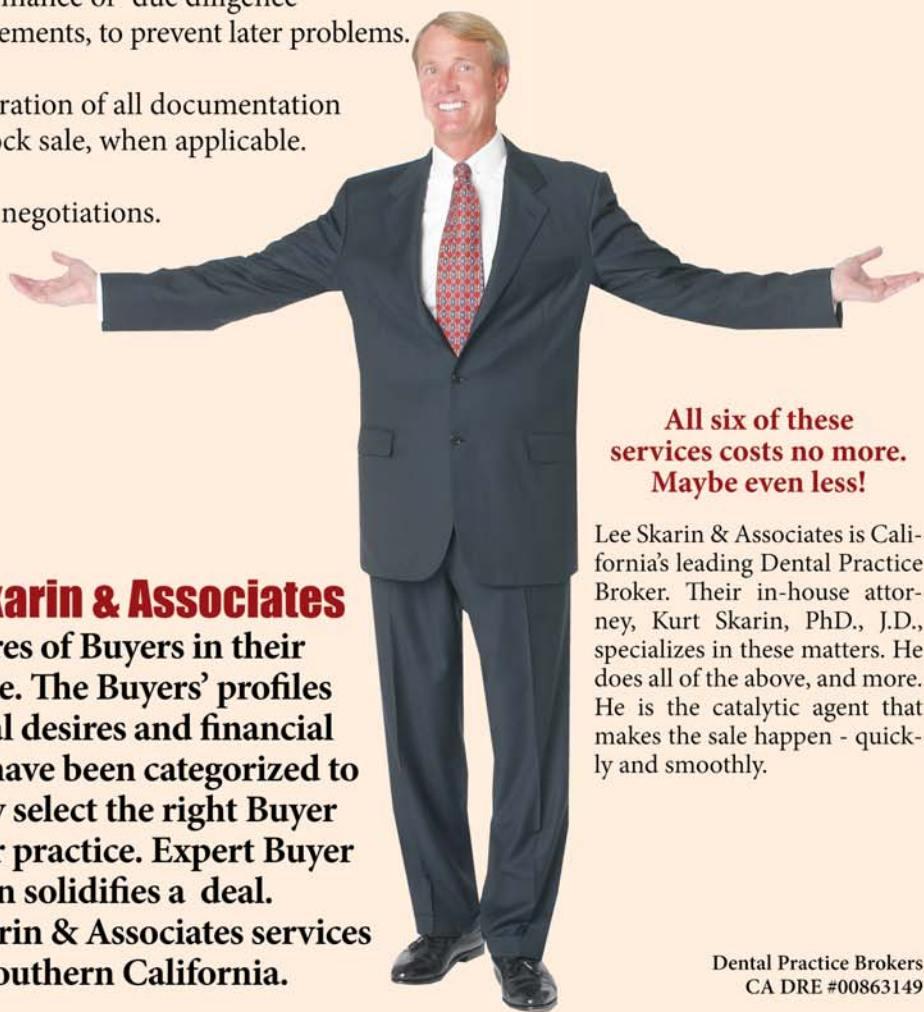
— Dental treatment chairs - BOYD M2000CB, Quantity - 5 chairs, Color-sangria. Mobile cabinets - Model 101 ORT, Quantity - 5 cabinets, top color - white, cabinet color - pewter. Stools - BOS-248, Quantity - 5 Stools - Color- gray. Equipment in good condition! Best offer. Send email to braces1@earthlink.net.

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DR. BOB, CONTINUED FROM 150

wasn't necessary, sort of gilding the lily, but to make the acquisition even sweeter is a snippet of hair from his real head that was shorn when Elvis joined the Army. To put the cherry on the parfait, a special-edition, gold-plated record commemorating RCA's 1,000,000 sales of *Love Me Tender* is included. All this is impressively framed and irrefutably documented by experts, but the King's tooth is undeniably the *pièce de résistance*.

Because time is of the essence, each and every ADA member should immediately forward a check for \$50,000 to the ELVIS PRESLEY TOOTH ACQUISITION FUND. This is no time to be chintzy about a thing that is going to make the Rosetta Stone and King Tut's gold sarcophagus look like chopped liver. Our non-member colleagues should be extended a warm welcome to join us in our quest for what some are already calling the Holy Grail of Dentistry.

eBay reports on item 3616791479 (our tooth): starting bid was U.S. \$100,000. Immediately, 14 bids put the price at \$101,801. Five hours later, 57 bids had advanced the price to \$475,974. A few hours later, bidding showed no sign of slowing down at \$700,300.

The mind boggles!

To clarify exactly what it is that bidders are bidding on, eBay has thoughtfully put a picture of the famous tooth on its website. Being in the business and able to recognize a tooth, plebian or royal when we see it, we gave the image a close scrutiny to check out the irrefutable evidence of its authenticity.

The artifact is mounted on a smooth reflective surface. This shows class. It could have been placed on blue suede, which would have been tacky and cheapened the display, much like offering a view of the Hope diamond on red gingham tablecloth.

No question, this is a tooth, or more precisely, a part of a tooth. Actually, it is a PFM crown about shade A3.5 whose anatomy suggests it adorned tooth #18 at one time or another. It has a metal lingual collar at the gingival and may or may not have a porcelain facial shoulder. On the occlusal is a large hole, now filled with either cement or composite that represents the access route for a root canal operation. There are no roots. There is a slightly disturbing problem of semantics here. Can a crown be called a tooth when there is no tooth? Obviously, the bidders are not concerned with this

nicety or perhaps will be put off later when they discover that approximately 5 million or so similar-looking crowns are still in service with real root systems attached to real alveolar bone.

No matter, *this* crown is, or was, the King's, attests Ms. Thompson and that fact alone is enough for us to do all we can to see that it has a place of honor alongside G.V. Black's first extension for prevention and a rare piece of silicate cement that formerly graced the distal of Millard Fillmore's #8.

Let's get our money collected. It would be a crime to let this go to Robert Ripley. ■■■■



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All Shook Up Over Elvis' Tooth



Can a crown be called a tooth when there is no tooth? Obviously, the bidders are not concerned with this nicety.

➔ Robert E.
Horseman,
DDS

ILLUSTRATION
BY VAL B. MINA

If ever there was a time for organized dentistry to assert its leadership and show the flag, this is it. An opportunity for us to acquire one of history's most remarkable dental artifacts has burst upon the scene. There is no more fitting home for this treasure than the Dr. Samuel D. Harris National Museum of Dentistry and it behooves every man Jack of us (Jills, too) to make whatever sacrifices are necessary to see that the our gift does not fall into the hands of laymen who cannot appreciate the importance of the find.

The Smithsonian Institution has Judy Garland's red shoes, Archie Bunker's chair and Fonzie's jacket, but they pale into insignificance stacked up against our bonanza. Ready? It is *Elvis Presley's tooth!*

Here's the background: a nameless Florida entrepreneur has gathered some

very rare and nearly priceless items together in what he calls the "*Yellow Strawberry Memorabilia Collection.*" Chief among these is a tooth from the King's mouth. This rare piece was kept in the possession of Elvis' fiancée, Linda Thompson, until being acquired and later sold by the Elvis Presley Museum.

Now it is up for grabs on that vast electronic flea market, eBay. (*Editor's note: the King's tooth originally went on sale in 2003 and then again in 2007 but is no longer for sale on eBay.*)

The way the bidding is going, this beautifully mounted real Elvis tooth that was in his actual mouth, probably caressed by his dulcet tongue, and was instrumental in enabling him to gain 200 pounds, isn't going to last long. It

CONTINUES ON 149

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