CDA

Dental Identification
Disaster Readiness
Response Teams

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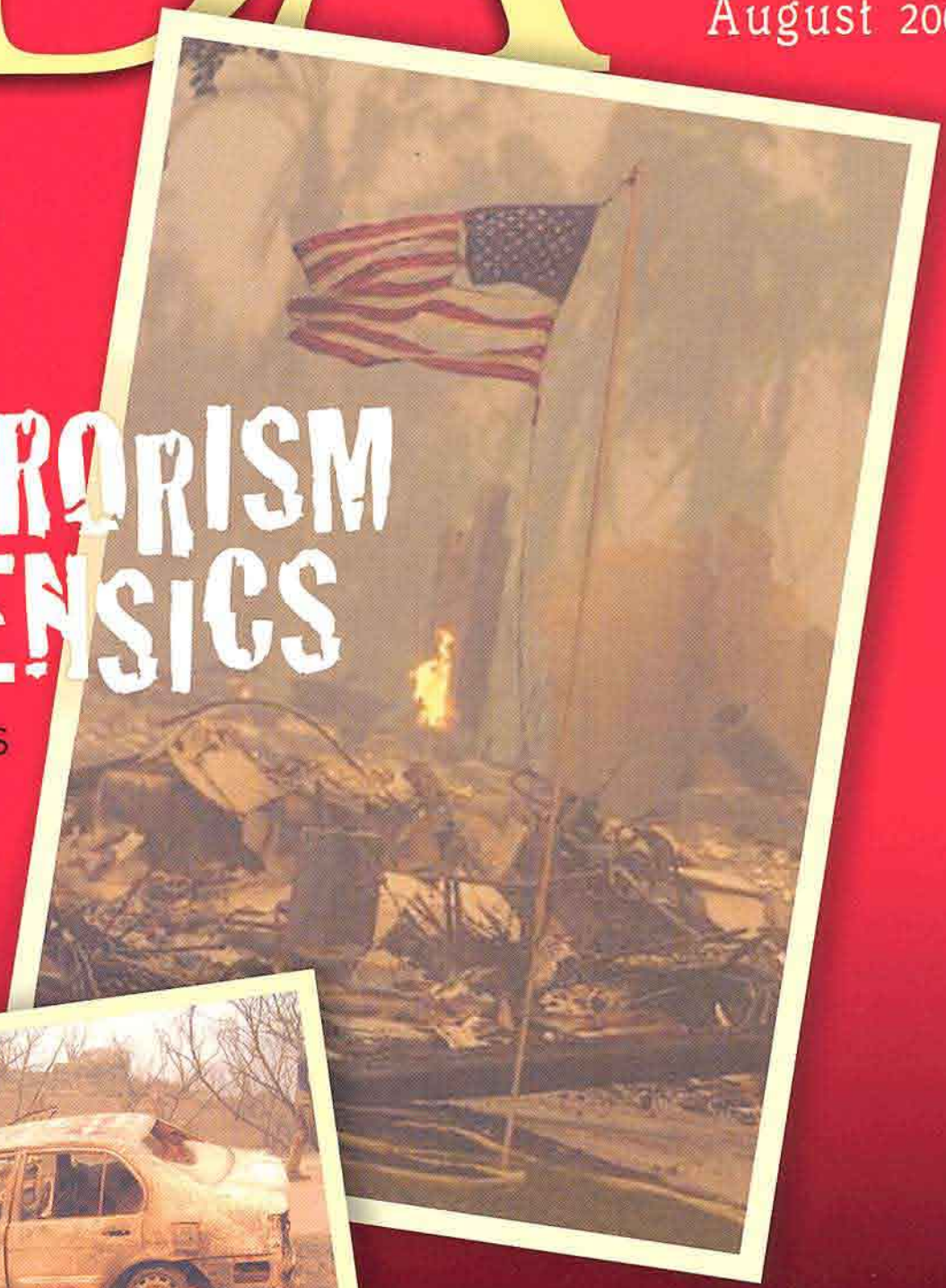

BIOTERRORISM & FORENSICS

Duane E. Spencer, DDS

OF THE CALIFORNIA DENTAL ASSOCIATION
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DEPARTMENTS

FEATURES

Jack F. Conley, DDS

Our 'Extended' Staff

The business of dentistry is in a constant state of flux. More is added to the plate of the dentist-owner of a dental practice every day to juggle in order to manage the dental practice effectively. There are new guidelines, rules, and regulations either to consider, to implement, or to govern our actions, constantly under discussion and development.

As for guidelines, in recent months we have seen a new classification for patients with hypertension, and best management practices for amalgam waste taking center stage. As for regulations, practices that file electronic claims will need to gear up to comply with the new HIPAA security regulations prior to April 2005. These regulations affect electronic transmission only and are in addition to the HIPAA privacy rules that went into effect in 2003.

The average practitioner among us finds out about these changes in a variety of ways. Word of mouth between colleagues, news in professional journals and newsletters, the web, and yes, sometimes we are even jolted by mention in the public media of important changes that will impact the practice of dentistry.

Faced with increasing personnel management responsibilities and increasing regulatory activity from legislative bodies and governmental agencies, the individual practitioner feels alone, supported only by what most hope is a small, loyal staff.

What many dentist members of California Dental Association don't realize is that they do have more than a small, loyal staff working day after day to support their practices. It is not always immediately apparent, but everyone who holds membership in CDA has another "team" of staff continuously working on their behalf. Personnel at the American Dental Association, at CDA, and at their local component society should be considered an "extended" staff family to achieve or maintain the best environment for their practice of dentistry and their patients as is possible. Unfortunately, many colleagues will see only the outcome that is the product of long debates with legislators and or regulators and fail to see that we do have staff (with input from key volunteers) working tirelessly and continuously to represent the interests of the profession.

Whether it is the Dental Board, the Legislature, a regulatory agency, or another policy-making body discussing an issue of importance to the dental practitioner, CDA has Public Policy staff arranging expert testimony, developing testimony, or providing expert testimony to the decision makers on our behalf.

Each year, a significant number of new or continuing issues arrive in proposed legislation to be debated by the committees of the California Legislature. These bills may encompass some modification to the practice of dentistry, access to dental care, licensure, Dental Board licensing exams, auxiliaries, scope of practice of dentists and auxiliaries, or guidelines for operation of mobile clinics to name just a few that have been discussed recently. The development and the debate on these legislative issues can be long and arduous, requiring careful monitoring by affected communities of interest, as in the case of the issues listed, the dental profession.

Everyone who holds membership in CDA has another "team" of staff continuously working on their behalf.

The colleague who finds out about these changes long after they happen and after reports surface in print or arrive in a special mailing from the dental association or a governmental agency, is often dissatisfied if the pending action will bring undesired changes to his or her practice. The reality is, that if this staff representation had not been in place, the results of these hearings and debates would undoubtedly result in even more dissatisfying change due to the lack of dental professional input into the process.

It is essential that we recognize the importance of the contributions of these professional staff who tirelessly work on our behalf to inform and educate policy makers on the issues. I have had the privilege of receiving and/or hearing periodic reports that describe the issues and the efforts to bring about the results desired by dental leadership for many years now. Once the positions of legislators or other decision makers are understood, it is easier to support the strategies that must be developed, and the compromises that sometimes must be negotiated, in an effort to bring an issue to closure. I realize the privilege described is neither available nor of interest to all members, which explains why some members may be dissatisfied with the final content of a bill or the resolution of an issue, and unaware of the value and the importance of staff contributions to the final product.

Careful planning and the tracking of legislation and issues important to the profession by the Public Policy staff helps to prevent the conflicts in representation and disorganized presentations that we saw on behalf of the profession many years ago.

Most important, their understanding and insights into the issues and the decision makers that comes from careful study, provides meaningful guidance to practitioners in the increasingly complex marketplace in which dental care is delivered. In carrying out these functions, they serve a valuable role that can ultimately affect the operation of the dental practice of every member.

We believe their considerable contributions to the interests of the dental profession, while often invisible to the average member, and sometimes misunderstood by those who see only the final outcomes of sometimes lengthy negotiations and controversial deliberation, should be acknowledged with appreciation. CDA

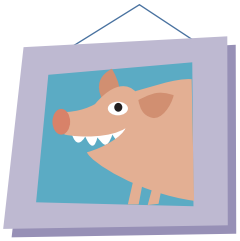
Illustration: Lee Ann Engle

Researchers Make Advances With Bioengineered Crown

Scientists have successfully used tissue-engineering techniques on rats to regenerate tooth crowns. This advancement follows the regeneration of pig tooth crowns and further demonstrates that it may be possible to grow new human teeth from one's own cells.

"We are very excited because mammalian systems tend to operate in similar ways," said Pamela Yelick, PhD, assistant member of the Forsyth Institute and principal investigator. "Having regenerated teeth of a second mammalian species allows us to hope for similar success with human teeth."

Yelick was among the researchers at the Forsyth Institute and Massachusetts General Hospital in Boston, and Universidade Federal de Sao Paulo in Brazil working on the study. The recent advancement appeared in the July issue of the *Journal of Dental Research* that also includes a British team's article on the use of nondental stem cells to grow primorida in mice and an editorial commentary on "the immense potential" for tissue-engineering and regenerative applications to dentistry.



"Within a year, we expect to determine whether the methods we use to regrow animals' teeth will be useful in regenerating human teeth."

PAMELA YELICK, PHD

"This groundbreaking science heralds a revolution in dentistry, in which biological tools will increasingly replace mechanical ones," said Dominick P. DePaola, DDS, PhD, Forsyth Institute's president and chief executive officer, of the newest development.

In 2002, Forsyth scientists regenerated pig tooth crowns. Researchers were able to grow small teeth from dissociated pig molar buds, but team members were not sure the new teeth had not materialized from "clumps" of incompletely dissociated tooth tissue.

In bioengineering rat teeth, the Forsyth team found it could maintain individual tooth-forming cells in culture for six days prior to implanting. This showed that adult dental stem cells can give rise to a dentin- and enamel-containing tooth crown as well as indicated the potential to expand enough cells in culture to grow teeth that are full size.

Researchers utilized methods similar to those Forsyth used in forming pig teeth. Scientists "seeded" cells from immature teeth of animals onto biodegradable polymer scaffolds. The scaffolds then were implanted in the abdomen of rat hosts. Taking into consideration the particulars of the experiment, small, identifiable tooth crowns formed within three to six months. Unlike the pig teeth study, scientists were able to generate individual, dissociated tooth bud cells in culture prior to them being implanted.

The Forsyth researchers, in both studies, used "adult" dental stem cells, which give rise to dental tissue. No "embryonic" stem cells, which can be induced to develop different types of tissue, were used.

"Our results show that individual tooth progenitor cells can interact with scaffolding to form tooth crowns and that it might be possible to culture enough dental stem cells to grow full-sized teeth," said Monica Duailibi, DDS, PhD, who conducted the work at Forsyth along with Silvio E. Duailibi, DDS, PhD, when both were doctoral candidates at UNIFESP. They now are postdoctoral researchers in the UNIFESP Department of Otorhinolaryngology and Head and Neck Surgery.

The researchers' goal is to develop ways to replace missing human teeth by growing new ones in an individual's jaw from their own cells.

"The results shown by the Forsyth-MGH-UNIFESP team promise new therapeutic options in dental medicine," said Paulo Augusto de Lima Pontes, MD, PhD, coordinator of UNIFESP Post-Graduate Department of Otorhinolaryngology and Head and Neck Surgery.

Researchers now are focusing on the potential to grow new teeth in a mammalian jaw and starting work with human tooth tissues.

"Within a year, we expect to determine whether the methods we use to regrow animals' teeth will be useful in regenerating human teeth," said Yelick. "If the methods prove effective, it will be at least seven years before they can be tested clinically in humans."

"Dr. Yelick and the combined team have made enormous progress toward the development of an engineered living tooth. As more knowledge is gained into the biologic and genetic mechanisms of tooth development, rational approaches in building living teeth from stem cells are now progressing from imagination into reality," said Dr. Joseph P. Vacanti, chief of the Department of Pediatric Surgery; surgeon-in-chief, Hospital for Children; director of Pediatric Transplantation, and director of the Laboratory for Tissue Engineering and Organ Fabrication at Massachusetts General Hospital.

In addition to Yelick, Duailibi and Vacanti, team members included Conan S. Young, PhD, and John D. Bartlett, PhD, of the Department of Cytokine Biology at Forsyth.

Harvard School of Dental Medicine and the Center for Integration of Medicine and Innovative Technology funded the study with additional support from Coordenaçao de Aperfeiçoamento de Pessoal de nivel Superior, UNIFESP, and the Forsyth Institute.

"Having helped fund this important research, we are proud to be collaborators in this future direction of dentistry," said Bruce Donoff, DMD, MD, dean of the Harvard School of Dental Medicine. "These advances are moving the field from technique-driven restoration to those based on biological solutions through regeneration. The possible impact on dental practice and oral health is far reaching."

Attention to Tobacco Can Help Avoid Malpractice Claims

Smoking or using tobacco products can have harmful effects on periodontal health and at times be a contributing cause of bone loss and periodontal disease, which could form the basis of malpractice against orthodontists, said Elizabeth Franklin in a recent issue of The *Bulletin*, a publication of the American Association of Orthodontists.

To avoid malpractice claims, Franklin, an insurance company claims manager, suggested dentists ask their patients about their tobacco use. Medical and dental history forms should include questions about the patient's habits.

Franklin also suggested that dentists encourage their patients to quit and even consider declining to treat a tobacco-using patient if it's determined his or her habit will result in a poor treatment outcome.

Should a dentist proceed with treating a patient who smokes or uses tobacco, excellent beginning records, and including X-rays and photos, should be taken to guard against allegations of exacerbating the patient's periodontal disease or the development of bone loss.

New Publication Gives Members the Edge on Dental Legal Issues

"I've been sued. What do I do? … Should I sign this contract? … When is a contract with an insurance plan fair and worth signing?"

The answers to these questions and more can be found in the ADA Legal Division's new publication, *Frequently Asked Legal Questions: A Guide for Dentists and the Dental Team*.

The publication covers topics ranging from insurance companies and employment law issues to HIPAA compliance and thorny patient care issues asked by member dentists during the past 10 years.

"Members have always had the ADA's legal counsel working on their behalf at the forefront of key advocacy issues and protecting them from inappropriate intrusions into their practices," said James B. Bramson, ADA executive director. "This publication is yet another example of that support."

The book is designed for quick reference and features sample checklists and contracts that dentists can modify to suit their particular legal requirements and practice.

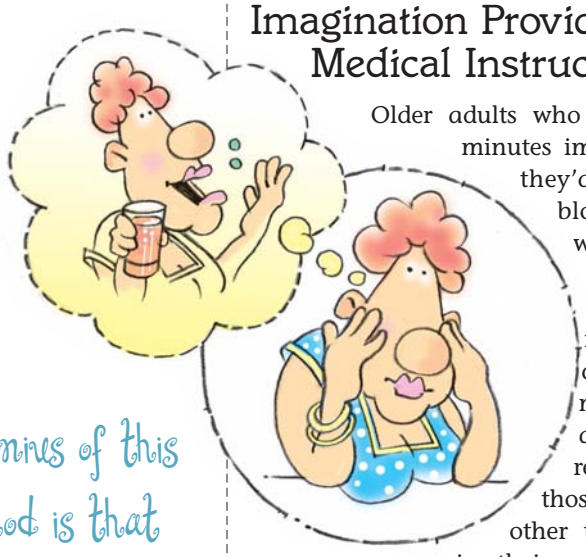
"Members should use this resource with their attorneys to stay ahead of the game on issues important to their practices," said Peter Sfikas, ADA chief legal counsel.

"The format of the book was structured to make dental legal issues more approachable and understandable," Sfikas said.

Mark Rubin, managing editor and associate general counsel added, "Questions are of tremendous value to us as we endeavor to serve members."

The publication, available through the ADA catalog for $89.95, is for ADA members only. In addition, it offers five hours of continuing education credits. To order, call (800) 947-4746 or visit www.adacatlog.org and specify item L756.

Imagination Provides Effective Prompt to Follow Medical Instructions



"The genius of this method is that it requires less conscious effort than other memory methods."

JEFFREY ELIAS, PHD

Older adults who spent a few minutes imagining how they'd test their blood sugar were 50 percent more likely to perform the tests and follow medical advice more regularly than those who utilized other techniques to jog their memory.

The study by Linda Liu, PhD, of the University of Michigan, and Denise Park, PhD, of the University of Illinois at Urbana-Champaign, which is supported by the National Institute on Aging, a part of the National Institutes of Health, appeared in the June issue of *Psychology and Aging*.

"This is an innovative study. It presents an unusual but apparently very effective way to use imagination as a memory tool to help older adults more successfully follow medical instructions," said Jeffrey Elias, PhD, of the NIA's Behavioral and Social Research Program.

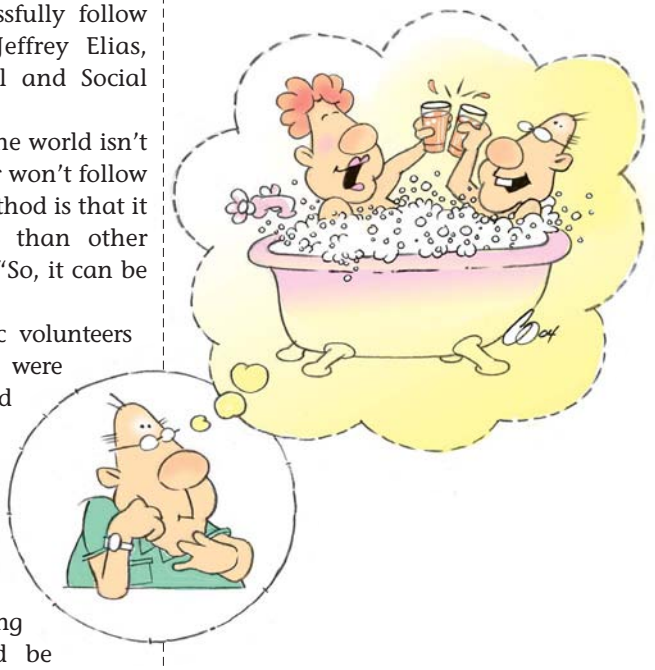
"The best medical care in the world isn't much good if a patient can't or won't follow through. The genius of this method is that it requires less conscious effort than other memory methods," Elias said. "So, it can be easily learned and applied."

In one test, 31 nondiabetic volunteers between the ages of 60 and 81 were placed in three groups and instructed to perform blood glucose tests in their homes. Participants in the implementation group, defined by the investigators as "imagination" intervention, spent one three-minute session envisioning specifically what they would be doing and where they would be the following day when they were scheduled to again test their blood-sugar levels.

Participants in the "rehearsal" group audibly read the instructions for the blood test and those in the "deliberation" group were given the task of writing a list of pros and cons for testing blood sugar.

Over the next three weeks, those in the "implementation" group remembered 76 percent of the time to perform the task at the proper times of the day compared to an average of 46 percent for the "rehearsal" and "deliberation" groups.

Park concluded that it's more effective to use one's imagination because it relies on automatic memory — a primitive component that does not deteriorate as one ages. For example, imagine the task of taking pills following a drink of juice in the morning. When one takes a sip of juice the next morning, that act provides an unconscious prompt to "automatically" take one's medication.



States Receive Aid for Public Health Preparedness

The U.S. Department of Health and Human Services has awarded an additional $849 million to states, four major metropolitan areas and territories in an effort to help strengthen the ability of government and public health agencies to respond to infectious diseases, natural disasters and bioterror attacks.

"This funding is a critical component to our national security," said Tommy G. Thompson, HHS secretary. "Our state and local public health system is the first line of defense when it comes to detection, reporting and containing a terrorist attack, an infectious disease outbreak or any other public health emergency."

Public health departments across the country, its territories and metro areas — Los Angeles, Chicago, New York City, and Washington, D.C. — will receive federal money from the CDC. Funding is earmarked to improve further the readiness of the public health sector and other major health care providers in responding to public health emergencies and bioterrorism.

The funding augments the $498 million already released earlier this month by HHS' Health Resources Services Agency to further support and enhance overall response capability. Since Sept. 11, 2001, HHS has invested more than $3.7 billion in strengthening the nation's public health infrastructure.

ADA Promotes Cooperation with Forensic Teams

Through Resolution 3H-2003, the ADA House of Delegates has encouraged dentists contacted by a forensic identification team to provide original dental radiographs to help identify disaster victims.

Following the Sept. 11, 2001, attacks, forensic experts reported difficulty in retrieving antemortem dental records from across the United States because some dentists were hesitant to provide original radiographs and records.

"Dentists' reluctance was sometimes based on an erroneous notion that practitioners could be subject to discipline by their state dental boards if they did not retain original records," said Dr. William Yeomans, a forensic dental expert who also directed the Pennsylvania Dental Association's Dental Identification Team. PADIT helped identify victims from the Sept. 11 United Airlines jet crash in western Pennsylvania.

The problem with copies, forensic experts said, is that some duplication methods don't show the fine, bony, trabecular patterns and root structures sometimes useful for identification.

George Stratigopoulos, DDS, chair of the ADA Council on Dental Practice, said the idea perpetuated throughout the profession that state dental boards will discipline dentists for providing original dental records and radiographs is untrue.

"By forwarding originals to the forensic experts and retaining a copy of the originals, everyone's objectives are met," Stratigopoulos said. The ADA resolution maintains that copies of records should be retained by dentists and originals be returned to the dentists when the records no longer are needed.

Dr. Yeomans said forensic dentists rarely, if ever, have problems obtaining original records when they speak with the treating dentist one on one.

Were You My Dentist?

Officials are trying to determine the identity of a human mandible found on a San Mateo County beach last November.

Only two molars and one implant were present; other mandibular teeth were lost through decomposition. However, a Brånemark implant (5 mm- wide platform design) replaced tooth No. 18. The screw, shaped like a star, holds the Cera One abutment, which was first manufactured in 2000. The restorative work on teeth Nos. 18, 19 and 30 is of high quality.

Those with any information regarding the possible identification of this person should contact Duane E. Spencer, DDS, at (925) 937-7000.

Honors


Dorfman


Glassman


Sutro


Wong

During the 105th annual Alumni Association meeting held recently, University of the Pacific School of Dentistry Dean Arthur A. Dugoni presented the 2004 Medallion of Distinction Award to **William Dorfman, DDS**, Beverly Hills; **Paul Glassman, DDS, MA, MBA**, Corte Madera; **Henry Sutro, DDS**, Oakland; and **Colin Wong, DDS**, Tiburon.

The award is the highest honor given by the organization to recognize individuals who have made outstanding contributions to the School of Dentistry, dental education, the community or research.

WCMID Hosts Fifth Annual Meeting

It was only five years ago the World Congress of Micro Dentistry first met to promote the conservative style of dental care. Since then, the organization, now known as the World Congress of Minimally Invasive Dentistry, has grown tremendously, said Joseph Whitehouse, MS, DDS, president of the organization.

At this year's event, to be held Aug. 11-14 at the Stanford Court Hotel in San Francisco, Jon Roth and Rolande Tellier will represent the CDA Foundation on the Caries Management by Risk Assessment panel along with members of the California dental schools and State Dental Board.

The CDA Foundation, though a joint venture with the Dental Health Foundation, was awarded a grant from First 5 California (formerly the California Children and Families Commission) to deliver a four-year, statewide oral health education and training program for dental, medical and safety net providers. The Foundation will work with CAMBRA and the five California dental schools to incorporate educational messages into their courses regarding the strategies and techniques to prevent early childhood caries.

Roth is executive director of the CDA Foundation and Tellier is the Foundation's director of education and training for dental providers.

Whitehouse is hopeful the upcoming fifth annual gathering will gain more momentum for next year's event in San Diego. "More education can only be good for the patient," said Whitehouse in a *Dental Products Report* interview, "and that to me is the bottom line."

For more information or to register for the meeting, call (800) 973-8003 or go to the WCMID website, www.wcmicrodentistry.com.

Upcoming Meetings

2004

Sept. 8-11	International Federation of Endodontic Association's sixth Endodontic World Congress, Brisbane, Queensland, Australia, www.ifea2004.im.com.au.
Sept. 10-12	CDA Fall Scientific Session, San Francisco, (866) CDA-MEMBER (232-6362).
Sept. 29-Oct. 2	American Association of Oral and Maxillofacial Surgeons 86th annual meeting, Scientific Session and Exhibition, San Francisco, www.aaoms.org
Sept. 30-Oct. 3	ADA Annual Session, Orlando, Fla., (312) 440-2500.
Nov. 7-13	U.S. Dental Tennis Association Annual Meeting, Palm Desert, (800) 445-2524, www.dentaltennis.org

2005

April 6-9	Academy of Laser Dentistry 12th annual Conference and Exhibition, New Orleans, (954) 346-3776.
April 12-16	International Dental Show, Cologne, Germany, www.koelnmesse.de
Aug. 11-14	Fifth Annual World Congress of Minimally Invasive Dentistry, San Francisco, (800) 973-8003.

To have an event included on this list of nonprofit association meetings, please send the information to Upcoming Meetings, *CDA Journal,* P.O. Box 13749, Sacramento, CA 95853 or fax the information to (916) 554-5962.

FORENSIC DENTISTRY: Dentistry and Bioterrorism

Duane E. Spencer, DDS

It has been said the history of forensic dentistry goes back to at least the days of Nero. The story goes that Nero had a woman in his life slain and he identified that it was the correct victim by recognizing a malposed canine in the woman's mouth. In U.S. history, the exhumed body of Gen. Joseph Warren, a prominent Boston physician, was identified by Paul Revere. Gen. Warren was killed in the Battle of Bunker Hill. Paul Revere, a metalsmith, had assisted a London dentist who practiced for a time in Boston. Upon viewing the body, Revere supposedly identified a prosthetic dental appliance he had adjusted for Dr. Warren at one time.

Since the 1960s, forensic dentistry has become more widely utilized, not only in North America but also throughout the world. Forensic dental identifications became more common in the cases of disasters, homicides and other causes of death, as did the analysis of bite mark evidence in criminal cases. The field of forensic dentistry began to expand in the United States as the use and importance of forensic dental evidence became apparent and widespread court acceptance for such evidence was gained. Forensic dental courses became available, such as those at the Armed Forces Institute of Pathology and the University of Texas, San Antonio, among others. Two forensic dental organizations were formed in the 1970s: the American Society of Forensic Odontology, (www.ASFO.org), an entry-level society for those interested in the field of dental forensics, and the American Board of Forensic Odontology, (www.ABFO.org), the certifying board for experienced forensic dentists. In 1991, the California Society of Forensic Dentistry, Inc., was established. The non-profit CSFD is comprised of forensic odontologists who are actively associated with a California coroner's/medical examiner's office or other law enforcement agency.

Author / Duane E. Spencer, DDS, has a private pediatric dental practice in Walnut Creek, Calif. He is a forensic dental consultant to the coroners in Alameda, Contra Costa and San Mateo counties, the California Department of Justice and numerous law enforcement agencies; a fellow of the American Academy of Forensic Sciences, a diplomate of the American Board of Forensic Odontology and a founding member/officer of the California Society of Forensic Dentistry, Inc. He is a frequent presenter to health and law enforcement groups in the fields of forensic odontology and child abuse.

Forensic dental consulting is not considered a lucrative field and should not be viewed as an endeavor to supplement a dentist's retirement.

By its members volunteering their time and experiences in presenting continuing education seminars to California dentists, dental auxiliaries, law enforcement and health professional groups, CSFD has been able to fund forensic research, work to update California's Department of Justice, Missing and Unidentified Persons' database, and contribute to other worthy forensic-related projects.

Although the number of dentists in the United States and Canada working in the field of forensic dentistry is probably in the high hundreds, there currently are only 89 active ABFO diplomates. California is the most well represented state with certified odontologists, currently with 15. Several more experienced California forensic dentists should soon be challenging the ABFO examination.

In recent years, there has been a marked increase in interest not only in forensic dentistry but also in other disciplines of forensic science. Sept. 11, 2001, provided a "wake-up call" to states to create or upgrade their dental identification teams. The media keeps us informed of the involvement of forensics in solving crimes and, of course, there are the television shows such "CSI," "New Detectives" and "Forensic Files," etc. This increased interest in forensics has produced the now common question from dentists, as well as hygienists and assistants, posed to CSFD members, "How can I get involved in forensic dentistry?" As California's county coroners/medical examiners usually have an identified forensic dental consultant and as these consultants keep their positions for a number of years, new positions only open up occasionally. Also, the actual casework in many counties is quite low. This being stated, there is not a large demand for new dental personnel in the forensic field. A dentist having a valid interest should contact his/her nearest forensic dental consultant to determine any need for assistance. Financially, forensic dental consulting is not considered a lucrative field and should not be viewed as an endeavor to supplement a dentist's retirement.

This issue of the *Journal* presents the readers with articles on forensic dental identification and a new area of concern to dentists, bioterrorism. The authors include not only well-respected forensic odontologists but also dental educators who are currently very active in the field of dentistry and bioterrorism.

Gerald L. Vale, DDS, MDS, MPH, JD, one of California's most experienced and respected forensic odontologists, presents an article on "Identification By Dental Evidence: Basics and Beyond" in which he discusses not only the fundamentals of dental identification but also other recent developments in the field of identification.

James D. Wood, DDS, was instrumental in the development of the California Dental Identification Team (CalDIT) and was its first director. As the current lead forensic dentist for Region 9 DMORT, who also deployed to New York City to aid in the identification efforts in 2001, Dr. Wood is well qualified to discuss the subject of California dentists and their readiness for a mass fatality incident.

Gregory Golden, DDS, was one of the first forensic odontologists called from out of state to NYC immediately following the World Trade Center disaster. Dr. Golden has written about the early dental identification efforts at the New York Medical Examiner's office in September 2001.

Anthony "Rick" Cardoza, DDS, the current CalDIT director, has authored an article on forensic dental identifications and their importance in the 2003 Southern California Cedar Fire. Drs. Cardoza and Norman "Skip" Sperber, another of California's highly respected odontologists, handled the identification efforts in that tragic disaster.

E. Dianne Rekow, DDS, PhD; Michael C. Alfano, DMD, PhD; and Walter J. Psoter, DDS, PhD, from the New York College of Dentistry, have contributed a valuable article on "Dentists Meeting Medical Surge Demand." What should the role of dentists be when the medical and public health systems have reached their capacities with a catastrophe? New and very important information to the dental reader concerning a subject we did not study in dental school.

Joyce Galligan, RN, DDS, who is on the staff of the University of Southern California, School of Dentistry, has rapidly become one of the lead dentists in California involved in how dentistry might be involved following a bioterrorism attack. Her article, which includes a poster for the reader's office, should be of high interest and importance to all dentists.

Due to the subjects and tragedies discussed in this issue of the *Journal*, I would not expect the reader to necessarily enjoy the articles written by these fine authors, but should find them both interesting and quite informative. The two articles on bioterrorism provide a great deal of new information and ideas for the dental profession. The authors clearly point out that dentistry should step up to the bioterrorism threat and promptly go forward in a responsible direction. As we go through these current, uncertain times in our country and the world, it is important to understand how dentistry is attempting to be prepared; not only for a readiness to identify those who die, but also for that bioterrorist attack we pray never happens. CDA

IDENTIFICATION BY DENTAL EVIDENCE: Basics and Beyond

Gerald L. Vale, DDS, MDS, MPH, JD

Abstract

The use of dental information to identify unknown persons is an essential part of the response to a mass fatality incident. Moreover, the likelihood of future disasters due to terrorism, earthquakes and other causes requires the dental profession to prepare for an expanded role that would include bioterrorism response and emergency medical care. However, the profession's role in identification procedures will continue to be a major responsibility because it will still be a vitally important function, and it is within our area of expertise. This paper will provide a working understanding of the fundamentals of identification by dental evidence. It will also touch on some recent developments in this area.

Identification by dental evidence has become a standard and highly valued procedure in both individual cases and mass fatality incidents, such as those of Sept. 11, 2001.[1,2] This paper will present fundamentals and some advanced aspects of identification by dental evidence. The intent is (a) to provide those unfamiliar with dental identification with a working knowledge of the subject, (b) to provide those with some knowledge of the process with a review and update, and (c) to provide all readers with a frame of reference for the related papers in this issue.

Identifying an unknown person (living or dead) is profoundly important to the individual or the individual's estate, to his or her family and friends, and to the community at large. The identification process may establish whether a missing person is dead or may still be alive. In addition to the emotional impact of this information, it may enable the payment of insurance proceeds, probating the will, settling the estate, and determining the right of a spouse to remarry. It may also provide the basis for business decisions, such as the need to replace permanently a missing executive. In the case of a homicide, identification of the victim is crucial because it may lead investigators to a family member or acquaintance who committed the crime, or who can provide information leading to arrest of the killer.

The essential steps in the identification process are (1) performing a forensic dental examination of the unidentified individual and recording the findings, (2) obtaining and organizing dental information on the person or persons suspected of being the unidentified individual and (3) comparing the data on the missing person(s) with the data on the unknown individual. Procedures to follow if there is no clue to identity of the unknown person are described below under the heading "The Totally Unknown Victim."

Examination of the Unidentified Individual

Although dental identification of a **living** person is relatively rare, it may be required in the case of an individual who is unconscious or suspected of using a false identity, as in the Richard Ramirez case.[3] The present paper describes the far more common occurrence — forensic dental examination of a **deceased** person.

Prior to clinical examination, facial photographs and, if possible, intraoral photographs should be taken. Any dis-

Author / Gerald L. Vale, DDS, MDS, MPH, JD, is senior forensic dental consultant, Los Angeles County Department of Coroner.

Acknowledgment / The author expresses his sincere appreciation to Joseph A. Anselmo, DDS, for his review and for providing Figure 1.

tinctive features should be captured in the images (**Figure 1**). The author recommends digital photography because digital technology can produce high-quality images that can be instantly examined, making it possible to confirm the images are satisfactory while the evidence is still available. Moreover, the images can later be enhanced, if indicated, and sent easily and quickly to distant locations via e-mail or disk for consultation or other purpose.

In some cases, it is possible to examine the dental remains without performing surgical procedures, or with minimal incisions that can be repaired or concealed. This could be a benefit in the case of viewable remains. In other cases, access to the teeth may be limited by rigidity of the musculature. This may be caused by conditions such as decomposition, rigor mortis, or charring of the soft tissues resulting from fire. In such cases it may be necessary to gain access by dissecting the soft tissues or performing a LeFort I osteotomy of the maxilla and a horizontal or tangential osteotomy of the ascending ramus of the mandible posterior to the last molar. This will permit removal of the jaws, which should be done only with approval of the forensic pathologist.[4] Further detail on surgical procedures is found in the American Board of Forensic Odontology (ABFO) Body Identification Guidelines, which are available in print or online at no cost.[5]

Additional photographs should be taken when full access to the teeth is gained. Occlusal views of both arches are essential because they frequently show many of the restorations and/or pathology that is present. Facial and lingual views should also be taken as indicated.

Radiographs of the unidentified remains are essential since radiographic comparison provides detailed and reliable information. It is considered the gold standard for identification by dental evidence. The radiographic study should document all dental evidence in sufficient detail to permit accurate comparisons. If the jaws are relatively intact, this will usually include a "full mouth" series similar or identical to that used for live persons. If bitewing views are not feasible, separate views of the upper and lower posterior teeth can be made on periapical film using horizontal bitewing angulation.

Charred teeth are extremely fragile and must be handled carefully. Loose teeth should be carefully replaced in the correct socket and secured with an adhesive substance prior to X-ray. If the jaws are fragmented or individual teeth are found, they are radiographed on periapical, occlusal or lateral plate film, depending on size.

It is important to radiograph all edentulous areas and edentulous jaws since they may contain impacted teeth, irregular trabecular bone patterns or other information valuable for identification. Occasionally, edentulous areas retain outlines of the alveolar sockets of extracted teeth that can be compared to antemortem X-rays. Double-pack films are recommended so that one set of films can stay with the case file and one set can be forwarded as necessary. If films are duplicated it is important to label the left and right sides of the duplicates to avoid possible errors in orienting the films.

A dental chart of the unidentified dental remains should be prepared. In California, this should be done on the California Department of Justice Unidentified Deceased Reporting Form whenever possible. Uniformity of charting is extremely important in order to facilitate comparison and database entry. Consequently, the team should have standard charting procedures that

Figure 1. Case 1: Martini glass design in a live subject illustrates dental feature that could be valuable in establishing identity due to its infrequent occurrence.

are followed by all personnel. The Universal tooth numbering system should be used, and notations should be made for all teeth. Thus, the chart might indicate that a tooth is present but not restored — which can be abbreviated PN — or would indicate the surfaces restored, type of filling material, caries, fractures or other features. Missing teeth should be designated as missing antemortem (healed socket) or missing peri/postmortem (empty socket). Implants, dentures, or other prostheses should be recorded, noting materials used if known.

Emphasis should always be placed on noting and recording abnormal or distinctive features, such as peg-shaped, supernumerary, or malpositioned teeth. In short, the dental chart should record all information that might help to distinguish the unidentified individual from others in the population.

Examining Dental Records of the Suspected Victim

Identity of the deceased may be suspected because he/she died in his/her own home or automobile, carried identifying information, had been reported missing, or has physical characteristics, clothing, or other personal effects similar to those of the suspected victim. The investigative agency, such

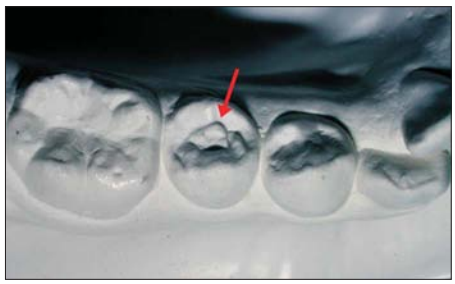


Figure 2a. Case 2: Old orthodontic model of suspected victim shows unusual nodular protuberance on occlusal of No. 29 and malposition of No. 26.

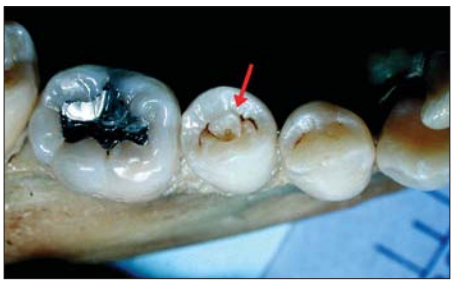


Figure 2b. Case 2: Identically shaped protuberance on No. 29 and similar malposition of No. 26 on unidentified body strongly supports identification.

Figure 3. Case 3: Work model of suspected victim shows crown preparation and detailed match of occlusal anatomy and position of each tooth, establishing identification.

as the coroner's office, will normally contact the suspected victim's family to locate the victim's dentist and obtain dental records. In some cases records are obtained from hospitals, military record depositories, jails, or other sources.

The importance of dental records in establishing identification in a disaster is one of the many reasons for a dentist to maintain high-quality patient records that contain all essential information. Such records may spare the patient's family weeks or months of pain and anxiety while awaiting identification. In a homicide, prompt identification of the victim may greatly speed the capture of the killer.

California dentists should be aware that when a missing person investigation is underway, a dentist is required by law to release dental records of the missing person within 10 days after being presented with a release form signed by a family member or next of kin. The dentist has this same duty in a missing person investigation if presented with a declaration signed by a police officer authorizing the dentist to release the dental X-rays.[6,7]

The dental office should provide as much dental information as possible. Radiographs are the most important records for identification because they provide the most detailed information and are far less likely to contain errors than written records. However, the dental chart is also very important because it updates the radiographs by showing work that was done after the radiographs were taken. Equally important, when treatment listed on the chart of the suspected victim is also found in the mouth of the unidentified individual, this strongly supports the proposition that the antemortem information and the postmortem information are from the same individual.

The dentist should personally confirm that the correct dental records are being sent out, and that any duplicated charts or radiographs are readable. Duplicated radiographs should be marked "left" and "right" to avoid errors in orientation. Original radiographs are preferred.

It is accurate to say that any item that records information about the suspected victim's teeth can serve as a basis for comparison in the identification process. This has included old orthodontic casts or radiographs made many years before the subject's death (even if made prior to tooth movement), old dentures, old "work models" or study models, custom bleach trays or custom splints (**Figures 2a, 2b, 3**). If such items are available, the dentist should either forward them to the coroner's office or send a note that they are available.

What if No Dental Records Can Be Found?

In some cases there is a suspected victim, but no dental records of that individual can be located. However, it is often possible to obtain smiling photographs, which can be enlarged to show dental information. These photographs can then be compared to dental information from the unidentified "Doe." This comparison may provide helpful information that supports other findings. In the rare case in which the antemortem photographs show highly distinctive features or a large number of less distinctive features, it may be possible to establish identification, or rule it out, solely based on the photographic comparison (**Figure 4a, 4b, 4c, 5a, 5b**).

If no dental records and no photographs can be obtained, it may be necessary to consider verbal or written descriptions of the appearance of the subject's teeth. For example, an investigator may report, "His mother says that one of his top teeth is twisted around." Obviously, the precision and reliability of this information leaves much to be desired. Such information may be considered suggestive or supportive, but it should seldom, if ever, be considered the sole basis for identification.

Consideration should also be given to the possibility of obtaining DNA

Figure 4a. Case 4: Enlarged photograph of suspected victim. Compare Figure 4b as to rotation and incisal edge of No. 10 and relative size and shape of Nos. 8, 9.

Figure 4b. Case 4: Assembled fragments of "Doe" show supportive similarity to dentition in Figure 4a, but fall short of positive identification.

Figure 4c. Case 4: When the position of teeth No. 22 to No. 28 is compared to Figure 4a, the added information establishes identification in this rare case. Note that No. 26 incisal edge was chipped postmortem.

Figure 5a. Case 5: Photo of a young woman who subsequently disappeared. Figure 5b, photo of skull with face reconstructed in clay was presented for comparison.

Figure 5b. Case 5: Fracture of No. 9, movement of No. 10 could have occurred after photo in 5a. Inconsistent anatomy of No. 7, No. 10 was irreconcilable, negating identification.

Figure 6. Case 6: Skull of teenage murder victim killed by shotgun injury to back of skull. Due to lack of identifying information, case remains unsolved.

from the victim's teeth and comparing it to DNA obtained from a toothbrush or hairbrush from the suspected victim.

The Totally Unknown Victim

If the coroner is unable to determine an individual's identity, California law requires the coroner have a dentist examine the remains and prepare dental records. This data is sent to the Missing and Unidentified Persons Section of the California Department of Justice in Sacramento. The database of dental records of missing persons is then searched for a possible match to the dental records of the unidentified body. Some notable "hits" have been made in this manner. Unfortunately, however, only a small percentage of the missing person cases have dental records in the DOJ database, which limits the productivity of the system (**Figure 6**). This excellent system can be made far more effective if an improved national database system is fully implemented, and if dental records can be obtained for a higher proportion of missing persons.

Comparing Records of the Suspected Victim and the Unidentified Body

In order to compare antemortem and postmortem records efficiently, both sets of data must be in a similar format. Because incoming antemortem records vary greatly, they must be "translated" into the dental team's standard format and entered on suitable antemortem charts. In a mass fatality incident involving a large number of charts, entering the antemortem information is a major task.

The basic purpose of the comparison process is to determine whether the dental records of the unidentified individual and the dental records of the suspected victim both describe the same person. The method of making the comparison will vary, depending on the number of victims and the type of information available, e.g. fragments vs. intact jaws, full mouth radiographs vs. no antemortem radiographs, etc. In cases involving a large number of vic-

Figure 7a. Case 7: Note contour of restoration, shape of crowns, pulps, axial angulation of No. 5 and No. 31 and contour of alveolar bone in suspected victim.

Figure 7b. Case 7: "Doe" shows marked similarities to features seen in 7a, including distinctive outline of restoration with distal tag. Identification was positive.

tims, computer programs greatly expedite the process, producing a list of best matches. The final determination is made by the investigators.

The most common method of comparison in a case with good records is to compare the radiographs and chart of the suspected victim to the radiographs and chart of the unidentified individual (**Figure 7a, 7b**). When additional antemortem materials are available such as work models, diagnostic models, bleach trays, or descriptions of the teeth, they may provide further evidence to support the conclusion (**Figure 3**). In rare cases, they may be successfully used in the absence of radiographs or charts.

Dentures, including complete dentures, may be useful when found. Section 1706 of the Dental Practice Act requires that every complete upper or lower denture must be marked with the patient's name or Social Security number unless the patient objects. Initials may be used if use of the name is not practical. The dentist determines the location and the patient has the choice of which marking is used. Dentists should comply with this requirement routinely. Identifying information in dentures is not only valuable in case of a disaster, it also makes it possible to locate lost dentures when they are removed in a convalescent facility or in a hospital operating room. The dentist must keep records of the marked dentures and must not release the records, except to law enforcement officers if needed for identification or to anyone authorized by the patient.

Dentures may also be used for identification in quite a different way. If there is a suspected victim, the family may be able to provide a spare denture or an old denture known to belong to the suspected victim. These dentures can be compared to the jaws of the unidentified individual as to anatomy, size and fit. Because of decomposition of soft tissues, precise fit is not expected. However, the degree of similarity can help determine whether the denture and jaw originate from the same person (**Figure 8**).

Details of the Comparison

It is important to consider the details to be examined in the comparison. While some obvious features will seem to jump out at the examiner, every tooth and feature that can be compared should be examined to assure there are no discrepancies and that the conclusion is accurate. Dental features found to be particularly helpful in making comparisons at the Los Angeles County Department of Coroner are listed with this article. The ABFO guidelines provide a more extensive listing.

Important

When there appears to be a discrepancy between the two sets of records, the examiner must carefully determine whether it could be caused by something that happened after the first records were made. Example 1: A tooth has a small filling antemortem, but the postmortem filling is larger. Explanation: The tooth could have been restored again after the antemortem film was taken. This does not defeat identification. Example 2: A tooth has a large metallic filling antemortem. However, the postmortem radiographs and examination show that the tooth has only a small filling, with no part of the filling missing. Since a metallic filling does not become smaller over time unless part of it breaks off, the suspected victim is not the unidentified individual. Unexplainable inconsistencies defeat identification.

Selected Features to Compare

- Are the same teeth and restorations present? If not, are the differences logical over the time involved?
- Can the dental procedures listed on the antemortem chart be found in the postmortem remains?
- Are the restorations seen in radiographs, including crowns and fixed partial dentures, similar as to type, size, and detailed shape?

Continued on Page 671

Figure 8. Case 8: Denture from home of suspected victim placed on "Doe's" maxilla. The degree of fit helped to support identification. (Photo inverted for publication).

Continued from Page 669

■ Are the teeth similarly positioned, including axial angulation, degree of rotation, contact points and interdental spacing?

■ Is the anatomy of the teeth similar as to size and shape of roots and crowns, including attrition and occlusal anatomy (if models, etc. are available)?

■ Is there similarity in size and shape of pulp chambers and root canals, and have they become smaller over time rather than larger?

■ Is the supporting bone similar as to height, contour, and density?

■ Are there features in the bone that can be cross-matched, such as dental implants, distinctive trabecular patterns, areas of condensed bone, pathology, supernumerary teeth, retained root fragments, retained amalgam particles, surgical materials such as bone plates, surgical screws or ligature wires?

■ Can the floor of the maxillary sinus, which is highly variable, be compared as to contour and relationship to roots of the teeth (**Figure 9**)?

Is the overall progression of physiologic and pathologic change, caries, periodontal disease, attrition, tooth loss, etc., consistent with the passage of time?

Figure 9a. Case 9: In a radiograph of a suspected victim, note contour of floor of maxillary sinus (arrow), its proximity to roots of No. 12 and No. 15, and shape of restorations.

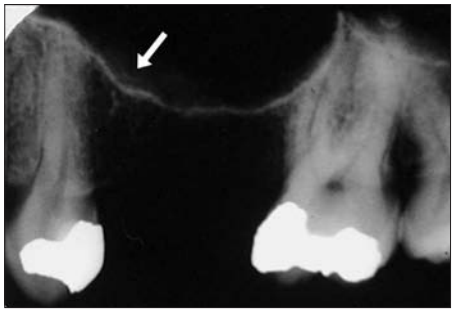


Figure 9b. Case 9: Radiograph of unidentified Doe shows features markedly similar to those of suspected victim, including relationship of floor of sinus to No. 12 and No. 15.

Reaching a Conclusion

ABFO guidelines state that the possible conclusions of a dental identification study are positive identification, possible identification, insufficient evidence to form the basis for a conclusion, or exclusion.[8] The guidelines indicate that positive identification is established when "The antemortem and postmortem data match in sufficient detail to establish that they are from the same individual. In addition, there are no irreconcilable discrepancies." However, the guidelines offer no definition of "sufficient detail."

At an ADA-sponsored symposium on dentistry in mass disaster identification, a work group proposed "Identification may be considered positive if there are 12 or more matching dental features and no irreconcilable discrepancies. However, the required number of matching features may be reduced if, in the judgment of the examiner, one or more of the identifying features is distinctive."[9]

Some experienced forensic dentists have found this approach helpful in evaluating the weight of identifying information. However, it is not supported by scientific data. Consequently, in determining identification, the dentist is presently required to base his or her final conclusion on the dentist's judgment and experience rather than on numerical criteria. An exception is that a single confirmed inconsistent feature excludes the subject from consideration as a match.

Some Current Issues Regarding Dental Identification

Advances in technology, particularly digital technology, have greatly improved methods and procedures in forensic dentistry. However, fundamental concepts remain intact. Some brief comments on the more recent developments are appropriate here.

Computer-assisted technology has been of great value in assembling and using data in both missing persons programs and the identification of victims in mass fatality incidents. A California odontologist, arriving to assist in the 2001 World Trade Center recovery efforts, learned that approximately 1,100 antemortem dental records had been received to date. He calculated that if he manually compared a set of postmortem dental records to each of the 1,100 antemortem records at an average of two minutes per antemortem record, the process would take well over 36 hours for the single case. In this investigation, as in others, computer technology proved to be a great asset in expediting comparisons by focusing efforts on the most likely matches. The dental team could then select records and radiographs much more efficiently, finalizing identification as summarized above. The reader is referred to a paper by McGivney and Fixott for further information on computerized assistance in dental identification.[10]

Digital technology has assisted in identification procedures in other ways as well. Superimposition of images is a potentially valuable method that has had only limited application to identification in past years. This can be a simple and useful method of comparing radiographs and other types of images. However, there is an overriding problem when the opacity of the images obscures visibility, as is often the case when dental radiographs are superimposed. Currently, this problem is easily overcome by the use of software such as Adobe Photoshop.

Digital, digitally photographed or scanned radiographs can be readily resized, repositioned, and superimposed. Of particular importance, the opacity of the images can be adjusted as necessary, permitting excellent visualization. One can superimpose several teeth, individual teeth, individual restorations, etc.[11] Thus, superimposition can now be a useful tool in evaluating similarities or differences.

As newer techniques in the use of DNA continued to find wider applicability, there were questions as to whether DNA profiling would replace the use of dental evidence in both personal identification and bite mark analysis. However, with a few painful exceptions, the present status is that DNA evidence and dental evidence are often mutually supportive, rather than antagonistic. This symbiotic relationship was apparent when the California DOJ established a DNA data bank for cases of unidentified persons, or persons missing under suspicious circumstances. In this program, DOJ would, for example, compare the DNA of an unidentified person to DNA of a family member of the suspected victim. However, the Department made it clear that DNA analysis would be undertaken only after efforts to use fingerprints, dental or anthropological data.[12] Cost and timeliness are presumably factors in this policy. In a mass fatality incident, the unidentified body or body fragments may pass through several identification stations and may be identified in more than one way.[13] For example, a body may be identified by dental evidence and fingerprints, or by dental and DNA, etc. Such redundancy reduces the possibility of error.

The present article has made reference to the need for the dentist to rely largely on judgment and experience in reaching a conclusion on identification. However, spurred by the Daubert decision and others, courts are increasingly favoring techniques based on scientific methodology with known error rates. Although it presently appears applicable only to cases relying on chart comparisons in the absence of radiographic evidence, a recent study may offer a glimpse into the future. The study relied on two large sets of data to determine the frequency of various patterns of missing, filled, and unrestored teeth. The diversity of dental patterns was surprisingly high, reportedly comparable to the diversity of mitochondrial DNA sequences. When the dental pattern of an unidentified individual and the suspected victim are the same, the significance of the match can be determined by considering the frequency with which this pattern occurs in the reference data. This permits the dentist to base the conclusion on evidence that is quantifiable, rather than on a subjective opinion.[14] It is suggested this is the direction in which all forms of identification need to move.

The present status is that DNA evidence and dental evidence are often mutually supportive, rather than antagonistic.

Conclusion

This paper presented basic considerations in establishing identification by dental evidence, and has touched on some of the more recent developments. Other papers in this issue deal with application of these and other principles in mass fatality incidents. Newly emerging aspects of forensic dentistry are also presented. We must prepare to deal with the rapidly occurring changes in the world in which we live. CDA

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To request a printed copy of this article, please contact / Gerald L. Vale, DDS, MDS, MPH, JD, 14079 Arbolitos Drive, Poway, Calif., 92604.

LESSONS LEARNED FROM THE WTC DISASTER: A First-Person Account

Gregory S. Golden, DDS

Abstract

Sept. 11, 2001, was a day of learning for the world. We learned oceans do not isolate the United States from acts of terrorism. Prior to hijackers flying commercial airplanes into the Pentagon and World Trade Center towers, forensic investigators had never dealt with a mass fatality incident of this magnitude on the mainland soil of the U.S. during non-wartime conditions.

During the process of gearing up for the task of locating and identifying the victims, forensic dentists also learned a number of things. Established techniques for disaster management were tested to their extreme limits. Before and while this multi-functional effort was taking place, we familiarized ourselves with what techniques worked best under the immense pressure and tedious nature this job presented. Some of these accepted and now "tried and true" protocols are presented in this article.

Chances are pretty good that if you're old enough to read this article, you probably remember exactly where you were and what you were doing on the morning of Sept. 11, 2001. I certainly do. As I watched the local news bring the bizarre imagery of our own commercial aircraft flying into the World Trade Center towers, my first thoughts were of the potential loss of life; both of those in the airplanes, those trapped in the upper floors of the towers, and those on the ground and the fire/rescue teams ascending the stairwells.

Being involved with the forensic side of dentistry for more than 20 years, one becomes familiar with pretty much everything a disaster represents. A large part of the formal training in forensic dentistry is devoted to disaster preparedness and the process of identifying victims of multiple fatality incidents.[1,2] Seasoned forensic odontologists have seen plane crashes, floods, mass suicides, earthquakes, and fires, but nothing of this magnitude. Initial estimates of lives lost in the WTC disas-

Author / Gregory S. Golden, DDS, practices general dentistry in Rancho Cucamonga, Calif. He is a diplomate of the American Board of Forensic Odontology and chief odontologist for San Bernardino County and serves several Southern California counties as a forensic consultant for bite mark evaluations. He is an instructor at Loma Linda University School of Dentistry, and assisted in identifying victims of the World Trade Center disaster.

ter ranged in the tens of thousands. Only aggressive acts of war had equaled these numbers before. What was as astonishing as the horrific deed itself was the overwhelming response of humanitarian assistance that poured into New York City.

Mounting a Disaster Response

The monumental task of organizing the dental identification process fell on the shoulders of Jeff Burkes, DDS, chief odontologist for the City of New York. My first thoughts were concern for his and his family's safety. After reaching Jeff by phone, I was relieved to find out everyone was physically OK, albeit in shock this incident sprung from the hands of terrorists. During our conversation, we both understood that managing the identification process would require an extensive, multi-functional plan and substantial human resources. In hindsight, our predictions turned out to be somewhat prophetic. Throughout the next year, virtually every qualified forensic dentist in the United States and many more from abroad, voluntarily offered to assist.

Figure 1. The "palatial" living quarters of NYU Med School Dormitory.

Figure 2. Identification tag for security clearance throughout the Office of the Medical Examiner.

Jeff requested I organize a team of experienced odontologists who would be willing to travel to New York as soon as the Federal Aviation Administration lifted the ban on commercial flights, and were able to adapt easily to the stressful process. We are fortunate in California that there is a good number of dentists who not only are highly experienced and qualified to participate in a mass disaster, but who also meet on a regular basis for disaster planning and training sessions. I asked five other members of the California Society of Forensic Dentistry who, without hesitation, immediately agreed to join me in this mission: Drs. Gerald Vale, Joe Anselmo, Cathy Law, all from Los Angeles County; Dr. Norman "Skip" Sperber from San Diego and Imperial counties; and Dr. Janice Klim-Lemann from San Bernardino County.

If you're going to the "Big Apple," avoid staying in the NYU Medical School dormitory.

Travel arrangements were confirmed through a special executive agent from a national airline company who assured us that due to our humanitarian purpose for traveling to New York, the airline would charge our team members the lowest coach fare available but since the planes would be virtually empty, they would upgrade us to first class. Once we arrived at Ontario airport, we discovered from the local ticket agent that our reservations had been booked as first-class travel at first-class rate, which we unfortunately would have to pay immediately on-site before they could issue any tickets. In other words, a $300 round trip ticket turned into a $3,300 round-trip ticket. To make matters worse, the agent told us that since we'd booked travel inside the 14-day waiting period, the coach fare wasn't much better at $2800.

Upon our arrival to Newark, we were escorted by a group of the city's finest who provided us with one of the most unique midnight rides into Manhattan we could ever imagine: flashing lights and sirens accompanied by a 90 mph blitz through a deserted Holland Tunnel. This ride was cool. No traffic. In fact, no cars. The streets were shut down to everything but emergency vehicular movement. We made it from Newark Airport to downtown Manhattan within minutes. Imagine how we felt to see every street corner filled with throngs of New Yorkers cheering and waving American flags. There were homemade signs everywhere thanking the volunteers entering the city who had come in response to the call for help.

Just about the time we'd forgotten about the airlines' hoodwink and started feeling like VIPs we were escorted to what was to be our living quarters for the extent of our stay (**Figure 1**). Lesson learned No. 2: If you're going to the "Big Apple," avoid staying in the NYU

Figure 3. The main repository for antemortem records was located under the NYU Medical School and Hospital. Jeff Burkes, DDS, (in blue), consults with the author over chart storage capacity.

Figure 4. Working as a team minimized errors. Skip Sperber, DDS, confirms an identification as the rest of the antemortem section members observe.

Medical School dormitory. Our accommodations consisted of a mattress on the floor, a pillow, a pair of sheets and a towel. One sleepless night was enough to inspire all of us to find a quiet hotel within walking distance of our workplace, which we did immediately the next morning. I counted seven different types of sirens that night and could tell you each agency they were from without looking.

Security

Due to the heightened national security conditions, all personnel affiliated with the forensic investigation process had to be registered and credentialed before they were allowed to assist in the process of handling or identifying human remains. Each of the dental team members was issued an identification tag from the Office of the Medical Examiner (**Figure 2**). Once verified and listed on the forensic dental personnel roster, each team member was assigned a work shift.

During the first week, media estimates for the actual number of murdered victims changed daily. National and local news issued a call for dental and medical records. The requests produced a public response from surviving families that led to a flood of incoming charts, photos, X-rays, and other related documents. Collection centers were established throughout the city at Port Authority Police centers. There were security concerns about possible further acts of terrorism (anthrax, bombs, etc.) being concealed in incoming records. Once inspected and cleared for delivery, the records were transported to the Medical Examiner's Office by Port Authority couriers. After delivery, the contents of each set of records were organized and the information for the missing individual was segregated into specific divisions of the medical examiner's office. Along with the Dental ID Section, other sections were created to handle medical records, physical descriptions, photos, DNA samples, and fingerprint records (**Figures 3 and 4**).

Dental Identification Process

The Dental ID Section was structured in compliance with the existing guidelines established and accepted by the American Board of Forensic Odontology.[3] The identification process essentially calls for a formulation of an antemortem team, postmortem team, and comparison team, with a separate custodian of records.

The postmortem team is responsible for completing dental autopsies. Their duties include re-assembling jaw and tooth fragments where possible, photography, radiography, and charting of dental restorations and other existing conditions found for each victim. Each case requires a separate postmortem set of data to be accumulated for each decedent who enters the morgue facility. Where there is fragmentation, the process includes treating each fragment as a separate case, particularly when there is no method of determining from whom the fragment came.

From past lessons learned in other multiple fatality incidents, an established protocol exists for individual

Figure 5. Entrance to the Office of the Medical Examiner from First Avenue.

Figure 6. Refrigeration trailers used for storage of victims.

team members working together in pairs or groups of three, depending on the human resources and according to their levels of experience.[4] From previous incidents, it has been determined that charting errors can be minimized when exams are conducted with one person entering data into the computer or writing down restorations while the other verbally describes the condition of the teeth. The data is re-checked before going on to the next case.

The antemortem team compiles the dental records of missing persons. They interpret and transpose these dental records, oftentimes originating from foreign countries and in languages other than English, into Universal dental notation. This method is repeated to create a dental chart of existing restorations and oral conditions of each missing person. Radiographs and dental treatment noted from the missing individual's dental records are all helpful tools for establishing a dental picture of the suspected victim. The same protocol for working in pairs or threes applies for the antemortem charting process.

Once both antemortem and postmortem charts are completed, the comparison team enters the dental data into WinID, a computer software program designed especially for forensic odontology.[5] This program was developed for multiple fatality incidents in order to facilitate identification of decedents. It accomplishes this by searching for similarities of dental conditions between antemortem and postmortem databases, primarily by looking at filled surfaces and the presence or absence of teeth. During data entry, team members again work in pairs to minimize errors.

Delegation of Responsibility

In order to preserve continuity and cooperation among and between teams, tour commanders were appointed by the chief odontologist. Typically, the tour commanders were board-certified odontologists who had previous experience with a multiple fatality incident, or had completed numerous dental identifications. The job of the tour commander was multifaceted. The primary responsibility was to oversee the operation of each section during his shift, to ensure the team workers were performing their tasks according to the recommended guidelines and accepted standards of the science. The job also included troubleshooting problems as they arose, fielding questions, and occasionally serving as overqualified "gofers" when supplies ran out.

Each team's shift initially was set at 12 hours. Lesson learned No. 3: A 12-hour shift was counterproductive due to mental and physical exhaustion of team members. Ultimately, shifts were reduced to four hours to minimize burn out. It was also highly recommended that while on duty, team members switch duties and work in other sections during their shifts for a change of scenery and tasks. Psychological debriefing was also an integral part of the daily activities that helped section members deal with the impact and mental stresses that accompanied the job.

Psychological debriefing was also an integral part of the daily activities that helped section members deal with the impact and mental stresses that accompanied the job.

The Facility

The Office of the County Medical Examiner is a large multi-level building, able to handle the normal day-to-day influx of victims who die in the greater Manhattan and several surrounding boroughs of New York City (**Figure 5**). In order to accommodate the anticipated influx of victims, refrigeration trailers were set up for storage of remains until their processing and distribution could be completed (**Figure 6**).

As decedents arrived, they would

go through several stages of processing. The FBI had a team of fingerprint specialists who rotated through shifts, rolling fingers for prints whenever applicable. Forensic pathologists autopsied and photographed victims, collected DNA samples, and determined cause and manner of death. From that point, postmortem dental team members would complete the dental exam, chart, and X-ray any dental evidence present. Each decedent would then be numerically tagged and temporarily stored in a refrigeration unit.

Figure 7. Debris sifting continues at Fresh Kills Landfill, Staten Island.

The Need for Inter-Agency Cooperation

In the beginning, the local and volunteer odontologists were required to share space, information, and supplies with the Disaster Mortuary Operational Response Teams. This federally funded program is part of the U.S. Department of Homeland Security.[6] DMORT teams are made up of people with varied backgrounds in medico-legal investigation, technicians, and specialists. The mission of DMORT is to provide support during a disaster. They do this by providing equipment and people, both which can be deployed wherever and whenever needed.

One great opportunity to learn about inter-agency cooperation presented itself after Alaska Air Flight 261 that crashed Jan. 31, 2000, in the Pacific Ocean off the coast of Ventura, Calif. There were several post-incident problems that occurred, which ultimately affected how disaster management has evolved and affected inter-agency cooperation.[7] Similarly, in the first week of the WTC disaster the local odontologists, outside volunteer odontologists, and DMORT dentists found themselves frequently working at cross purposes with each other. This fact became more obvious after having several differences of opinion regarding disaster management protocol from individuals with differing backgrounds and levels of experience.

> Many of the passengers were from the Dominican Republic and had treatment records written in Spanish, which had to be deciphered into Universal notation.

In an effort of fairness and in an attempt to determine which computer software program would be most effective for sorting decedents with missing victims, three software systems were in place during the initial processing of dental data: CAV-ID, (a proprietary program developed by a local New York odontologist), CAPMI, (originally a U.S. Army program still in use at the California Department of Justice for the Missing and Unidentified Persons Unit), and WinID, currently used by the U.S. Military and DMORT teams.

DMORT arrived at the facility with their own laptop computers preloaded with WinID. However, only DMORT personnel were permitted access to them. The local odontologists and outside volunteers were directed to use the other software programs for entry into private, separate computers, thus tripling the amount of work. Once the shortcomings of the two other programs were realized and common sense prevailed, WinID was accepted as the official software, and computer sharing was established after some ground rules for usage were developed.

Another organizational snafu surfaced regarding how to designate incoming charts alpha-numerically so that filing and retrieval between other divisions and within the dental sections would be managed. After several inter-agency changes, chart labeling became uniform throughout the entire medical examiner's facility. Each case designation stayed the same regardless of what division of the facility had records for it. That way, when someone in any division referred to a specific case, any of the other divisions would be able to retrieve the exact records for that same missing person. Once the

standard protocols had been established for each division and everybody was on the same page, the rest of the work was fairly simple, other than the extended amount of time it took to complete the job.

Other Surprises

A month after the Twin Towers fell, American Airlines Flight 587 crashed into a neighborhood in Queens, N.Y. There was virtually no negative impact on the identification process that was already set up to handle the numbers of victims already anticipated. From the dental standpoint, the most difficult part of managing the air crash was interpreting the antemortem dental information. Many of the passengers were from the Dominican Republic and had treatment records written in Spanish, which had to be deciphered into Universal notation.

Final Statistics and Thoughts

The identification process for the WTC victims continued for more than a year. Debris from the 16-acre crime scene was ultimately transported by barges to Staten Island where it was sifted and inspected for anything of evidentiary value (**Figure 7**). The final statistics on the WTC disaster provide some interesting facts. Of the 2,762 death certificates issued, (not counting the 10 terrorists on the two airplanes) 645 were identified by DNA; 188 by dental; 71 by fingerprints; 19 by personal effects; and 16 by photographs.[8] Considering the severity of the obliteration of some of the victims, it is noteworthy the dental identification numbers were that high. Most of those people trapped inside of the towers were vaporized into the dust cloud generated as the towers fell. Later, one firefighter told me the temperature at "Ground Zero" remained for months at more than 1,000 degrees. He complained the soles of his boots kept melting.

For each of us California dentists, the forensic teams and selfless heroes we met and enjoyed working with during our time in New York was a bittersweet emotional experience none will ever forget and hope never to see again. For the patriotic heroes who died there, I repeat this message found on a piece of paper taped to a delicatessen door near Ground Zero where a few fortunate survivors took shelter from the dust cloud:

"I see them come with tears in their eyes

So I offer my ears and I hear their cries

I offer my shoulder to help carry their sorrow

I offer my hands to help build their tomorrows

I brought my body and left my home

To come help people I've never known

To bring them back, out of their pain

This I will do again, and again, and again." CDA

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To request a printed copy of this article, please contact / Gregory S. Golden, DDS, 8577 Haven Ave., Suite 105, Rancho Cucamonga, Calif., 91730.

MASS FATALITY INCIDENTS:

Are California Dentists Ready to Respond?

James D. Wood, DDS, and George Gould, DDS

Abstract

The role of dentists in identifying victims of mass disasters is well documented. The organization of dentists who are trained in identification procedures at a local, state, or federal level may be a valuable resource in the event of a mass disaster in California. This article explores the organization of dentists available to assist in a mass disaster at the state and federal level.

The role of dentists in mass fatality incidents in California is well documented. Readers are no doubt aware of some of the major incidents that dentists have played a role in during the last 25 years (**Table 1**). Victims of mass disasters are often not identifiable visually due to extensive trauma and fire. The dental response to these incidents is usually assistance in the identification of the victims. The California Dental Association's House of Delegates approved a resolution in 2002 to support the concept of a "Mass Disaster Response Team" that has two components: a dental identification team, and a bioterrorism response team. Dentists are uniquely qualified to be of assistance in both categories. However, this article discusses the preparedness for a mass disaster involving the need for dental identifications.

A recent survey of all 50 states conducted for this article found a wide range of preparedness levels by dentists for dental identification activities (**Table 2**). The survey results indicated that some large states such as Florida, New York, and Texas do not have state dental identifications teams but rely on a network of regional teams and federal assistance. In addition to local and regional teams in California, a group of dentists, well trained in forensic dental identification, has chosen to establish a statewide team for possible use in a disaster involving fatalities of 50 or more individuals. The team is called the California Dental Identification Team.

California Dental Identification Team

CalDIT was founded in early 2002 in the aftermath of the terrorist attacks on the World Trade Center, the Pentagon, and the hijacking and subsequent crash of United Flight 93 in Pennsylvania. CalDIT currently has 36 active members. Team members have an active affiliation with a local law

Authors / James D. Wood, DDS, is a family practice dentist in Cloverdale, Calif., and a diplomate of the American Board of Forensic Odontology; a fellow of the Academy of General Dentistry, a fellow of the Academy of Forensic Sciences, and a fellow of the American College of Dentists. He also is a forensic dental consultant to the Mendocino and Sonoma counties' sheriff's departments and the Santa Rosa Police Department.

George Gould, DDS, is a full-time dental consultant for Delta Dental Plan of California's DentiCal Division; provides consultation services to the California Department of Justice's Missing and Unidentified Persons Bureau, as well as to the Sacramento and Placer counties' coroner and sheriff's departments. He is a diplomate of the American Board of Forensic Odontology, and a fellow of the American Academy of Forensic Sciences.

Table 1

Major Mass Fatality Incidents in California

- PSA Flight 182 (San Diego) — Sept. 25, 1978
- Aero Mexico Flight 498 (Cerritos) — Aug. 31, 1986
- PSA Flight 1771 (San Luis Obispo) — Dec. 7, 1987
- Loma Prieta Earthquake — Oct. 17, 1989
- U.S. Airways 737 and Skywest Metroliner (LAX) — Feb. 1, 1991
- East Bay Firestorm — Oct. 20-21, 1991
- Alaska Airlines Flight 261 (Ventura) — Jan. 31, 2000

Table 2

Dental Identification Teams Nationwide

- 30 state dental identification teams
- 26 teams are supported in some way by their state dental associations.
- Range of time in place — 1 year to 23 years
- Number of members — from 4 to 75
- Two states are in the process of starting a dental identification team.

enforcement agency or their local coroner or medical examiner and significant experience in the process of dental identification. CalDIT is sponsored by the California Society of Forensic Dentistry, Inc. and supported in concept by the CDA. Members of CalDIT are volunteers. CSFD has provided financial support for training and would likely support some of the team's expenses should it be activated. CSFD offers continuing education on forensic topics to law enforcement, dentists, dental hygienists, and dental assistants. Fees for these courses support CSFD's ongoing efforts to assist local law enforcement and the California Department of Justice in active cases involving human identification, child abuse, and child safety education.

California has a large number of highly trained and very experienced forensic odontologists. Creating an organizational structure to account for the diversity of the state's population and geographical features has been a challenge. The director of the team is the chief administrator for the team. Supporting the director are two deputy directors, one for Northern California and one for Southern California. The CalDIT organizational structure was developed to complement the California Governor's Office of Emergency Services Coroner's Mutual Aid Program.[1] The Office of Emergency Services has divided the state into several regions based on geography and population centers. Each OES region has a key contact dentist. In addition, individual counties typically contract with local dentists for forensic consulting. There are several counties such as Los Angeles, Sacramento, San Diego, and Santa Barbara/Ventura that have individual identification teams. The role of CalDIT is to support any existing local organizations or teams dedicated to dental identification. CalDIT members are encouraged to identify other dentists and auxiliary personnel in their area who may have training in forensic dental techniques to fill support roles should the team be activated.

It is expected that a deployment of CalDIT would happen through a very specific chain of command. Working under the assumption that a "mass fatality incident is an incident where the local agency encounters one more fatality than can be reasonably handled,"[2] the use of a resource such as CalDIT would come from a request by the coroner or medical examiner to OES for assistance. The CalDIT director would deploy a small team of dentists (a GO Team) to work with the local dentist and assess the needs of the local authorities. Based upon this assessment, the activation of the entire team could be accomplished in 24 to 72 hours.

The team is divided into several sections. The components of the team follow a structure prescribed by the American Board of Forensic Odontology.[3]

Administrative Section

This group oversees the entire operation and is responsible for scheduling shifts of dentists and support personnel.

GO Team

The function of this small, first response team is to evaluate the disaster situation in order to determine manpower requirements and begin notifying the appropriate team members. The local forensic odontologist would act as liaison between the GO Team and the local coroner/medical examiner. Members would provide assistance with body recovery procedures to ensure that dental evidence is not lost or damaged. Finally, this team would assess the disas-

ter morgue location to determine the most suitable site for CalDIT to operate, and make a determination of what equipment and support will be needed to operate.

Postmortem Section

This section is responsible for the completion of an examination of the recovered dental remains. This documentation includes photography, radiography, and charting of all dental structures and restorations. Dental charts of recovered dental specimens are created for entry into a computer database. Digital radiography will be used as the preferred method of obtaining postmortem radiographs. This eliminates darkroom requirements and X-ray processor chemistry. This also saves a great deal of time in processing remains. Necessary retakes of X-rays can be made within seconds — not minutes as in traditional dental radiography.

Antemortem Section

This section is responsible for transcribing all available clinical information onto an antemortem dental chart for each suspected decedent. The documentation collected would include radiographs, written record of treatment, dental study models, and any other dental information that might be available. All antemortem dental X-rays are scanned into a digital database for use in comparison to recovered dental specimens.

Comparison Section

This group has the responsibility of comparing the antemortem and the postmortem dental records for the purpose of identification. This comparison is accomplished using a computer program created by Dr. James McGivney called WinID3.[4] The program makes use of dental and anthropometric characteristics to rank possible matches. As the name suggests, WinID3 is a Windows-based program and uses Microsoft Access databases. A variety of graphics can be displayed including photographs and scanned dental and medical X-rays (**Figures 1 and 2**). The program has been used successfully in many mass disasters. The combination of digital photography, digital radiography, and WinID3 can substantially

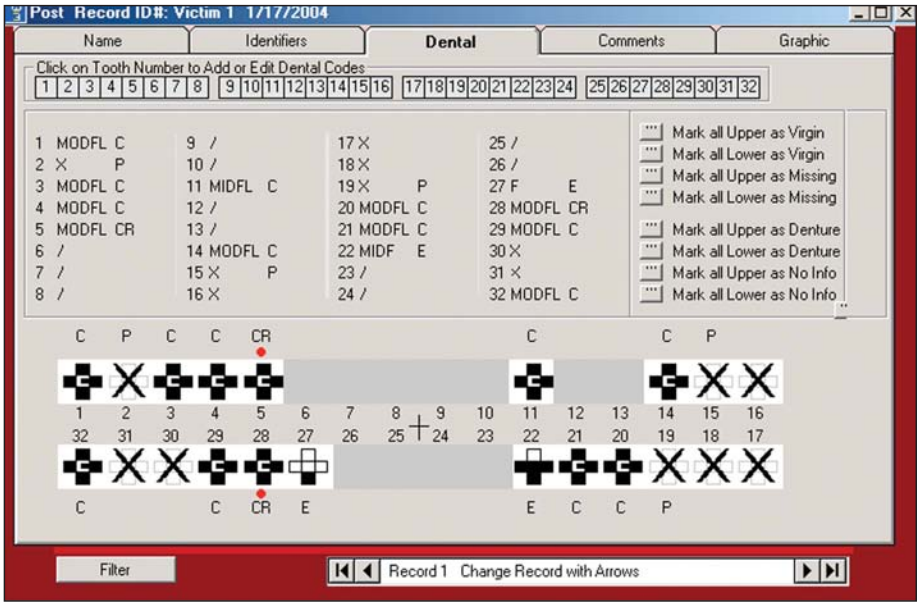

Figure 1. Sample of postmortem charting of dental remains in WinID3, courtesy of Raymond Johansen, DMD.

Figure 2. Sample of direct comparison of antemortem and postmortem X-rays in WinID3, courtesy of Raymond Johansen, DMD.

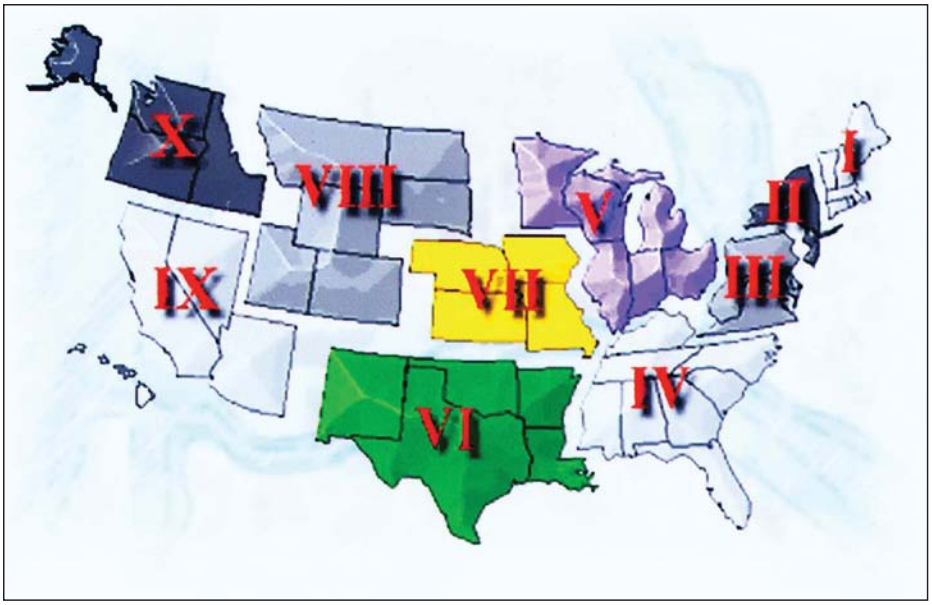

Figure 3. DMORT Regions in the United States.

Table 3

DMORT Team Composition

Medical examiners/coroners	Forensic pathologists
Forensic anthropologists	Fingerprint specialists
Forensic odontologists	Funeral directors/embalmers
Dental hygienists/assistants	X-ray technicians
Photographic specialists	Heavy equipment operators
Mental health specialists	DNA specialists
Computer specialists	Medical records technicians
Administrative support staff	Security personnel
Investigative personnel	Evidence specialists

decrease the time required to make a dental identification. Antemortem and postmortem radiographs can be displayed simultaneously allowing for direct comparison.

Team Support Section

This group assists in providing basic physical comforts such as transportation, food, and lodging.

Yearly training is an important aspect of member retention and readiness. The initial training for CalDIT in May 2003 involved a hands-on exercise working with the collection and assimilation of digital information into the WinID3 program. A current limitation of CalDIT is lack of equipment and supplies necessary to perform identifications on fatalities numbering greater than 50.

Disaster Mortuary Operational Response Team

DMORT is a program of the U.S. Department of Homeland Security.[5] The organization falls under the Emergency Preparedness and Response Directorate for the U.S. government, within the Federal Emergency Management Agency as a component of the National Disaster Medical System. The organization responds only when requested. Requests are made by local agencies through specific procedures necessary for requesting federal assistance. The role of DMORT is "to assist local authorities during a Mass Fatality Incident," which is defined as "an incident where more deaths occur that can be handled by local resources."[2]

The concept of an organization like DMORT began in the early 1980's with a committee of the National Funeral Directors to address the fatalities often accompanying a mass disaster.[2] The committee eventually established a non-profit organization that was open to all types of forensic personnel. They developed a portable morgue unit that could be deployed anywhere in the world by rail, sea, or air on very short notice. With the passage of the Family Assistance Act in 1996, American air carriers were required to have a plan in place to assist the families of victims of an accident. About this time, the federal government joined with the National Funeral Directors Association and the current version of DMORT was developed. The National Transportation and Safety Board can activate DMORT in the event of a mass disaster involving aircraft, trains, and ships.

The DMORT organization is divided into 10 regional teams. Originally, members of the National Funeral Directors Association comprised the 10 Regional Commanders serving under a national command staff. As personnel have retired, new regional

Table 4

DMORT Can Provide

Mobile morgue operations	Forensic examinations
DNA acquisition	Services for identification of remains
Search and recovery	Scene documentation
Embalming/casketing	Records data entry
Personal effects processing	Database administration
Communications equipment	Medical/psychology support

Table 5

Major DMORT Missions

- 1995 — Murrah Federal Building, Oklahoma City, Okla.
- 1997 — Korean Air Flight 801, Guam
- 1999 — Amtrak Derailment, Bourbonnaise, Ill.
- 1999 — Egypt Air Flight 990, near Nantucket Island, Mass.
- 2000 — Alaska Airlines Flight 261, Ventura County, Calif.
- 2001 — World Trade Center, New York City, N.Y.
- 2001 — United Airlines Flight 93, Somerset County, Pa.
- 2001 — The Pentagon, Washington, D.C.
- 2001 — American Airlines Flight 587, Belle Harbor, N.Y.
- 2003 — NASA Shuttle Columbia, Houston, Texas
- 2003 — Night Club Fire, West Warwick, R.I.

commanders have replaced the funeral directors. These new leaders are people with extensive emergency management experience and forensic specialists. The funeral directors continue to play a role in the organization. The current total membership within the entire organization is approximately 1,200. California is part of Region 9 that also includes Arizona, Hawaii, and Nevada (**Figure 3**). The Region 9 team currently has about 120 members. DMORT teams have a very diverse group of specialties represented (**Table 3**). There are about 15 dentists on the team.

No single team may have all of the personnel types listed in **Table 3**. Commanders have the ability to request personnel from other teams as needed. DMORT can provide a wide variety of services as part of its mission (**Table 4**).

Critical to the mission of "support" that DMORT provides is the Disaster Portable Morgue Unit. There are two such units available: one in Maryland and one in California. They can be deployed wherever needed by plane, train, or truck. The DPMU contains everything necessary to operate a morgue. Everything is pre-packaged including instruments, paper supplies, computers, cameras, film, and X-ray machines. There are more than 10,000 items in each DPMU. In addition, there is a DPMU team that would accompany the unit to its destination. This team would be on-site to assist in set up, operation of the morgue, and eventually packaging and restocking once the unit is no longer needed. One cannot underestimate the potential value of the DPMU alone. DMORT has been deployed to many areas (**Table 5**) and has ample opportunities to improve and perfect the composition and set up of the DPMU.

Alaska Air Flight 261

The Response of a Local Dental ID Team and DMORT

The following is a description and commentary regarding the disaster response of a Ventura-based dental identification team and DMORT. The reader should remember that a lot has transpired in the world since this incident. This was the first use of DMORT in a California mass fatality incident. Much was learned by local agencies and much was learned by DMORT. The final section of this article will discuss a potential relationship between DMORT and local dental identification teams in response to a mass disaster.

On Jan. 31, 2000, Alaska Airlines Flight 261, a passenger jet with 88 passengers and crew aboard plunged into the Pacific Ocean off the coast of Ventura. The McDonnell-Douglas 80 crashed in the water near Anacapa Island. There were no survivors. The aircraft had been having a flight control problem for about 30 minutes prior to the crash. It has been well documented that the flight control problem has been traced back to elements that control the horizontal wing (horizontal stabilizer trim system) of the tail assembly.[6]

Numerous sea vessels were available after the crash to assist in a rescue effort that soon transitioned to a recovery

Figure 4.. From left, Drs. Stephen Lojeski, George Gould and Al Tonn assimilate postmortem dental information during DMORT mock disaster training in October 2003.

Table 6

Ventura County Forensic Dental ID Team

C. Michael Bowers, DDS, JD
Paul Gabriel, DDS
Kent Hollenback, DDS
Ray Johansen, DMD

effort. The U.S. Navy was instrumental in the recovery of the aircraft and the remains of the victims. The Port Hueneme Seabee Base became the major base of operations. Soon after the crash, a portable morgue unit was set up by DMORT at the base. In addition, a DMORT family assistance team arrived along with the various other disciplines available to such an operation. The NTSB that had previously lacked consistent mortuary and family assistance services could now provide a more professional and centralized approach to dealing with the human aspects of the tragedy via DMORT.

A Ventura-based dental identification headed by C. Michael Bowers, DDS, JD, began organizing for the grim task of identifying the victims of the crash (**Table 6**). The degree of fragmentation of the plane and passengers was extreme. Ultimately, 22 people were identified on the basis of dental records. Unfortunately, 20 of the 88 people aboard the plane had no available antemortem dental records — thus there was no chance of dental identification. Passengers were identified on the basis of fingerprints, dental evidence, personal effects, and by DNA analysis. Conventional identification efforts ended March 18, 2000, while DNA analysis continued for several months.[7]

DMORT provided an excellent portable morgue unit and many excellent personnel. However, problems arose because the level of support provided by DMORT did not match the needs of the medical examiner's office. An after-incident report by Bowers noted that the onsite management of DMORT was not well versed on the development of identification evidence from the scene of the accident. There was conflict concerning the severely fragmented remains and the use of specific evidence as part of the identification process. It appeared that DMORT was too eager to transition to the use of DNA analysis for identification without exhausting traditional investigative techniques first.[7] While a tremendous amount of faith can be placed in DNA analysis, it is not always 100 percent effective. DNA analysis is also more costly, and requires a great deal of time to provide an answer, if the sample is of the quality that can even be properly analyzed.

A major frustration to the local dental identification team was the arrival of unsolicited assistance of dentists on the DMORT team. Three of the four "forensic" dentists had no practical forensic dental experience. Further, the dentists dispatched were not functionally literate on the computer system used by DMORT for dental identification, WinID2 (a previous version of the current software), and had no experience in digital imaging comparisons for dental identification. DMORT management expected the WinID2 system to be used instead of an established program developed by the U.S. Army called CAPMI 4 (Computer Assisted Postmortem Identification) program[8] that the local team was already familiar with. While these issues did not result in any misidentifications, or non-identifications, they produced challenges that compounded the stress involved in an already intense and emotionally taxing situation.

Bowers felt there was a significant discrepancy between the mission of support that is the defined role of DMORT and the actual daily field activities of the organization. In his opinion, managers who were funeral directors with little forensic training should yield to qualified forensic personnel. He noted that DMORT training was failing its own members by not providing a "clear understanding of all the steps required to produce a satisfactory outcome in a mass fatality incident such as the Alaska Air crash."[7]

While a mass disaster is a less than ideal place for the inexperienced forensic dentist to acquire practical experience, Bowers said that "if the forensic dental section of an identification operation is properly staffed and managed by experienced dentists, it is possible to offer inexperienced personnel who are adequately versed in forensic dental techniques and capabilities the opportunity to learn from their peers in the

Figure 5. Members of DMORT Region 9 learning to collect and identify evidence in DMORT mock disaster training.

Figure 6.. Debris field in DMORT mock disaster.

The total cost of the operation to recover the aircraft, recover and identify human remains, and process the accident scene was approximately $7 million.

field."[7] Alas, this was difficult in this incident because there was no clear agreement on systems and procedures to be used in the analysis of the dental information and remains.

Ultimately, 85 of the 88 passengers and crew were identified using medical, dental, fingerprint, and DNA analysis.[6] The total cost of the operation to recover the aircraft, recover and identify human remains, and process the accident scene was approximately $7 million. It is easy to see how a local jurisdiction without the resources of the NTSB and DMORT would be overwhelmed by the cost of such a tragedy.

DMORT Evolves

Since the crash of Alaska Airlines Flight 261, a great deal has happened in the world. DMORT has had many deployments and the organization has begun to evolve more as a true forensic organization that can deliver all of the services previously charged with (**Table 4**) along with more sophisticated evidence collection and processing capabilities. With changes from leadership with no forensic experience to the current regional commanders with varied disaster response skills, the concept continues to move forward.

Under FEMA, policy recommendations for DMORT are made by a Forensic Oversight Committee. A key member of this committee is Fred Jordan, MD, the current vice president of the National Association of Medical Examiners. This has led to the adoption of the NAME mass fatality plan:[9] a major step forward in the forensic organizational response to a disaster. Further, a national training curriculum has been established. Fifty percent of the training is to be standardized for all DMORT team members and 50 percent of the training will be based on the local needs of individual teams. Standardized training ensures that all DMORT team members have a background in the roles of all components of a team and insight into the overall role of DMORT in a mass fatality response.[10] Also, a component of the standardized training is emergency response to terrorism.[11] The required standardized training is a new key element in assuring that team members are committed and current in their roles with the team. The required training for the needs of the regional team ensures participants that they are vital components of the team and encourages members to establish a working relationship with other team members.

An Ideal Response

Should a major disaster involving many fatalities happen in California, dentists are ready to assist local agencies in identifying the victims. CalDIT is available to respond as needed by OES to assist and support the local dentist and coroner or medical examiner. Through established protocols, federal assistance may be appropriate via DMORT. A cooperative effort among participants should ensure that resources are available as needed and local control of the disaster scene is maintained if possible. Recognizing the extensive experience of members of the CalDIT Team, their expertise and input should be considered prior to the deployment of other dental personnel to assist in the identification efforts. In addition, the efficient operation of a team of experienced dentists will allow other less experienced dental personnel the opportunity to expand and enhance their skills. This opportunity will further enhance the quality and experience of all dental personnel to be better able to respond to the identification needs of a mass disaster.

Conclusions

Recovery and identification efforts for the World Trade Center, the Pentagon, and United Flight 93 after Sept. 11, 2001, proved that DMORT can be an extremely valuable resource, providing continuity and expertise in an extremely long and drawn out disaster. The magnitude of the events of Sept. 11, 2001, further illustrate that the resources necessary to conduct identifi-

cation procedures, which are the social norm for our society, can be immense. Local agencies simply cannot conduct these types of operations without extreme financial hardship. Identification of a family member allows families to begin the process of closure for the loss of a loved one, allows settlement of insurance, and settlement of estates. Dentists, as part of either a dental identification or a larger organization such as DMORT, can be a valuable resource in the event of a mass disaster involving many fatalities. CDA

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To request a printed copy of this article, please contact / James D. Wood, DDS, 102 S. Main St., Cloverdale, Calif., 95425.

Dental Forensic Identification in the 2003 Cedar Fire

Anthony R. Cardoza, DDS

Abstract

The Cedar Fire burned a large area of San Diego County in October 2003. By the time it was extinguished in mid-November, it had consumed more acres than any fire in California's history. Fifteen people lost their lives because of the fire. Forensic dentistry played a prominent role in the identification of the victims.

On Saturday, Oct. 25, 2003, a lost hunter lit a signal fire hoping to be rescued. Instead, he started a massive wildfire. When it finally was extinguished weeks later, it had consumed more acreage than any fire in California history. The hunter was in an area called Cedar Creek, just east of the community of Ramona in San Diego County, deep within the hills of the Cleveland National Forest. The area was generally inaccessible due to the rough terrain and 30 years of underbrush growth. In San Diego County, the average rainfall is nine inches per year. However, the average rainfall had been well below normal the past several years. As a result, the dead brush had a moisture content of 2 percent to 3 percent compared to paper, which has a moisture content of 10 percent.[1]

The fire began at sunset under fairly calm wind conditions. However, because of the extremely dry brush, it spread very rapidly and covered much ground. Air tankers were not allowed to respond that evening due to night flight restrictions and firefighters could not reach the fire's Ground Zero. The fire grew rapidly in size, moving west toward Ramona.

Suddenly, in the early evening, the Santa Ana winds increased and shifted direction. The front of the fire increased to a width of five miles and moved rapidly toward eastern Ramona, the Barona Indian Reservation, and Wildcat Canyon/Muth Valley. As the fire grew in size and ferocity, it grew into a force of incredible destruction. Raging through Wildcat Canyon, its speed approached 60 miles per hour. The fire consumed 33,000 acres in one hour, equal to nine acres per second. At that point, all rescue personnel could do was to focus on saving lives. "A hundred fire engines would not have been enough. The crews were there to rescue people."[2]

By 9 a.m. the next morning, the fire had consumed more than 150,000 acres and traveled almost 20 miles west through the communities of Ramona, Barona, Wildcat Canyon/Muth Valley, Lakeside/Eucalyptus Hills, Poway (south), and into Scripps Ranch moving up to and over the 10-lane Interstate 15. By Sunday night, the Cedar Fire raged south and east through the communities of Santee (north), El Cajon (east), Crest, Harbison Canyon, and Alpine. In its first full day,

Author / Anthony R. Cardoza, DDS, maintains a private practice of general dentistry in El Cajon Calif., and is a forensic dental consultant for the San Diego County Medical Examiner, the Imperial County Coroner, and the California Department of Justice in Sacramento. He currently is the Southern Regional Director of California DIT.

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it became the largest fire in San Diego County's history. Three days later, the Cedar Fire earned the distinction of being the largest fire in California's history consuming, more than 233,000 acres at an average of 6,000 acres per hour.[3] The fire overran the entire community of Lake Cuyamaca, destroying 90 percent of the homes and devastating the surrounding state park. On Wednesday, the fire headed back toward Julian to the north and Pine Valley to the east. The fire raged for several more days and was not fully contained until Nov. 16, 2003.

The Cedar Fire ultimately burned more than 270,000 acres, destroying 2,232 homes. The fire was fought by 877 fire engines and 5,203 firefighters from 325 departments.[4] The fire claimed 15 victims, including a firefighter from Novato, Calif.

Purpose of Dental Identification

Forensic dental identification specialists typically are the last conventional option for postmortem identification. DNA is also now utilized, but due to its high cost and the extensive time required for analysis, it is used sparingly or when no other option exists. This was seen recently in the identification of the remains of Laci Peterson, whose body was recovered headless and handless. Other forms of postmortem identification include visual, personal effects, fingerprints, scars, marks, tattoos, and medical radiographs.

Forensic dental identification has been successful because of the nature of the human dentition. Enamel is the hardest substance in the body and the only exposed portion of the skeletal system. Teeth are resistant to thermal damage and blunt force trauma. Therefore, the dentition remains stable during tissue decomposition. In addition, the dentition is unique to a specific individual. This includes not only the morphology of the coronal portion of the tooth, but also the morphology of the roots, pulpal chamber, and their relationship to their surrounding structures (i.e. sinus proximity, mandibular canal proximity, interproximal bony trabecular patterns etc.). If dental restorations are added, the unique combination for any given individual can factor into the millions.

There are numerous important reasons for identifying the deceased.[5] A legal certification of death is necessary to consummate legal matters such as life insurance, wills, etc. There are family and personal reasons as well, including closure. In criminal investigations, it is important to establish the identity of the victim in order to proceed with the criminal investigation and to identify the suspect.[6]

In a blaze such as the Cedar Fire, the bodies often are burned beyond visual recognition. Personal effects are also destroyed or lost in the fire. Even if the personal effects are recovered, they may not be considered reliable due to the typical calamity surrounding a fire. A forensic anthropologist can examine the remains of the skeletal system and often can determine age, race and sex of the victim. Positive identification is best performed by examination of the surviving dentition by the forensic odontologist. However, in cases such as the Cedar Fire, where the temperatures were at times very high (1000°C), even the dental remains may be destroyed. Crowns may fracture or explode leaving only the roots. The bone may also be completely consumed leaving only scattered roots with no bony sockets for reference.

Method of Dental Identification

Forensic dental identification is most often accomplished by comparing the radiographs of the teeth of the decedent (postmortem) with the dental radiographs obtained from the dentist of the suspected victim (antemortem). Ideally, the antemortem radiographs furnished should be the *original* full mouth series. Often this is not the case. Children's radiographs are typically bitewings only unless they have orthodontic records as well. Frequently, duplicate radiographs, rather than originals, are sent and they often have been either poorly duplicated and/or are not labeled right and left for orientation. In addition, the antemortem radiographic image may be of poor quality due to improper operator technique (cone cuts, overlapping interproximals, elongation/foreshortening, etc,) or poor processing (contrast, burned images, etc.). When poor antemortem radiographs are compared to an ideal postmortem radiograph, the two may not appear consistent. This could seriously hamper the identification effort.

> Enamel is the hardest substance in the body and the only exposed portion of the skeletal system.

In forensic dental identification, it is emphasized that good quality, properly mounted and labeled *original* antemortem radiographs be sent for comparison. In addition, copies of the victim's dental treatment progress notes should be submitted as well. This allows the forensic dentist to verify dental treatment that was performed subsequent to the date of the radiographs.

Identification of the Cedar Fire Victims

The majority of the Cedar Fire victims died the first night in the Wildcat Canyon/Muth Valley area. This was

Figure 1. The burned skeletal remains are reassembled by the forensic anthropologist for examination.

Figure 2. The dental fragmented remains of a fire victim. The remains were almost fully cremated.

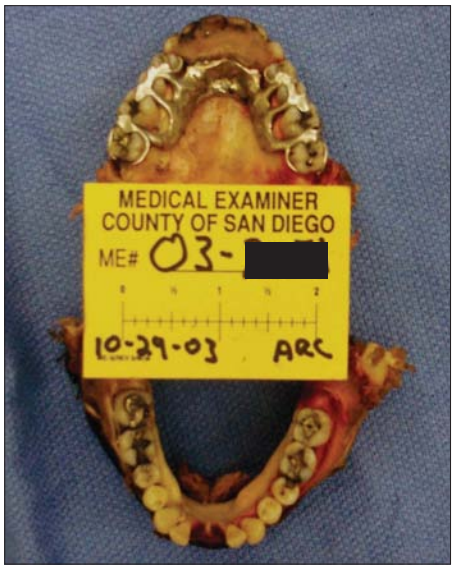

Figure 3. The mandible and maxilla have been resected from the body and are now ready for dental charting and radiography. Note the maxillary removable partial denture.

due to the rapid movement of the fire along with the lack of advance warning to those in the path of the fire. Two more victims lost their lives after the first night. One victim died in the Alpine area; the other victim, a firefighter, died when flames overran the fire engine. Medical examiner investigators initially had difficulty recovering some of the bodies due to the persistent flames and the threat of injury. In addition, the severely burned remains were very fragile, which made recovery difficult.

The victims' remains were examined by forensic pathologists and autopsies were performed. A forensic anthropologist then examined the remains and reassembled the skeletal structures when possible (**Figure 1**). While these examinations were occurring, investigators contacted each victim's family, friends, physician, and dentist to collect information for use in identification.

In San Diego County, there are two primary forensic odontologists on call to perform postmortem dental exams, Norman "Skip" Sperber, DDS, and the author. Sperber was on call Oct. 28, 2003, and he examined the initial seven cases. The author was called the following day for the next set of exams. Due to the extreme heat, the victims' remains were all badly charred; some were almost fully cremated.

With the antemortem radiographs in hand, the author took sufficient postmortem radiographs to allow for an adequate comparison. Sometimes, only one radiograph needs to be taken while at other times, a full mouth series must be completed. The author worked two evenings and one morning examining eight of the 15 victims. The examinations resulted in positive identifications for five of the eight victims. One of the unidentified victim's remains was very severely charred. The only dental remains consisted of charred roots and fragments of burned bone (**Figure 2**). There were no bony socket fragments for orientation. Unfortunately, the only antemortem radiographs available were four bitewing X-rays taken when the decedent was a young teen, more than 10 years earlier. The root morphology could not be seen in the bitewings, so a comparison could not be made. The other two victims who could not be identified were almost fully cremated, with no identifiable dental or bony structures.

The next dental identifications were two severely burned bodies with intact skulls and jaws. The mandible and maxilla were resected and the dental identifications were completed (**Figure 3**). It is interesting to note that on one of the cases, the American dentist of record furnished his most *recent* radiographs (four bitewings) from about four years prior. Only the most *recent* radiographs had been requested by the medical examiner investigator. The decedent had subsequent major reconstructive dental treatment performed in

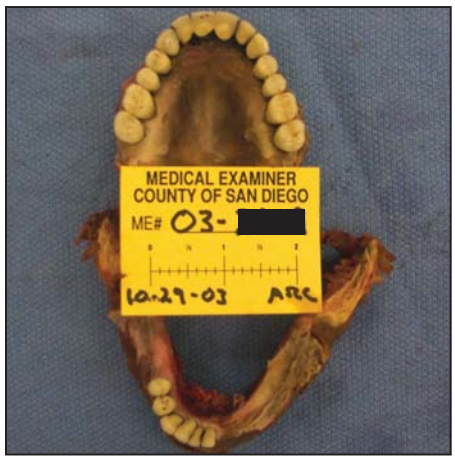

Figure 4. The resected jaws of a fire victim. Note the extensive crown and bridgework.

Figure 5. The dental fragmented remains of a fire victim. The remains were almost fully cremated but a crown and a three-unit bridge remained intact.

Figure 6. The intact three-unit bridge which was used for the identification.

Mexico after the last bitewing X-rays were taken, but the medical examiner investigator was unable to obtain any of those records. Fortunately, the local dentist also furnished copies of all the treatment progress charts. The decedent's subsequent treatment performed in Mexico was extensive, e.g., multiple extractions, full mouth porcelain fused to metal crowns and long span bridgework, (**Figure 4**) and upon initial comparison to the bitewings, it appeared the postmortem radiographs were not consistent with this individual, except for evidence on the bitewing of an endodontic fill on No. 13. In the treatment notes, the local dentist had previously taken a full mouth series of radiographs. The author then contacted this dentist and he personally delivered the additional radiographs the same evening. The endodontic restoration was consistent and the identification was completed. This illustrates the importance of furnishing all the records on file.

With the following two cases, the decedents had suffered very extensive thermal damage, again almost to complete cremation. Only a small portion of the cranium remained, the jaws were almost completely missing except for select posterior molars. It was fortunate that in both cases the antemortem radiographs furnished were complete full mouth series. Identifications were completed for both.

The author's final dental identification of the fire victims was one that involved international cooperation. On a set of remains that was nearly fully cremated, the medical examiner investigator was able to recover some dental root fragments and a three-unit porcelain fused to metal bridge (**Figure 5**). The victim's family stated the decedent's dental treatment was performed in Tijuana, Mexico. The medical examiner investigator spent nearly 10 weeks pursuing the leads in this case and finally was able to get the name of the decedent's dentist in Mexico. Meanwhile, the author determined the bridge was a maxillary right posterior bridge with teeth Nos. 4 and 6 the abutments and No. 5 the pontic (**Figure 6**).

With the name of the Mexican dentist, the author contacted Leon Dychter, DDS, chief forensic odontologist for the Courts of the State of Baja California, Mexico. Dychter met with the Mexican dentist. While he no longer had any of his treatment records concerning the decedent, he did recall placing the bridge. The Mexican dentist signed a sworn affidavit at the U.S. Consulate in Tijuana, Mexico, certifying he placed the bridge five years earlier. Though this identification was not ideal, the medical examiner and the author had a high enough degree of confidence to complete this case.

Discussion

Fire often plays a role in mass disasters, and the identification of the victims of the Cedar Fire once again illustrated the significant role forensic dental identification plays in a mass disaster. When one looks at the enormity of the Cedar Fire, the number of victims who perished could have been much greater if not for the heroic response of all emergency personnel. The author experienced these heroics firsthand the second night of the fire. Authorities instructed the author to evacuate his family to a safe area. The fire came within 300 yards of his residence. During the evacuation, the author witnessed several neighboring homes burning on the hillside. Several

of the author's patients, friends and colleagues lost their homes in the Cedar Fire. It is safe to say that everyone in this community was affected in some way.

Summary

In conclusion, it is noted California is well represented with dentists experienced in forensic odontology. California has the highest number of certified forensic odontologists compared to other states in the nation. In addition, we now have the California Dental Identification Team as a statewide resource.

To maximize the effectiveness of our forensic resources, it is important for practicing dentists to keep complete patient records on file and continually update them, including the radiographs. The records may be needed for postmortem dental identification. CDA

To request a printed copy of this article, please contact / Anthony R. Cardoza, DDS, 266-B Avocado Ave., El Cajon, Calif., 92020.

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MEETING A DISASTER'S MEDICAL SURGE DEMAND: Can Dentists Help?

Walter J. Psoter, DDS, PhD; Michael C. Alfano, DMD, PhD; and E. Dianne Rekow, DDS, PhD

Abstract

No one can deny that these are extraordinary times in world affairs. This is true not because there is turmoil in the world, which tends to be the norm, but because the problems in the world are dominated not by countries or religions, but by individuals and radical sects for whom life seems far too expendable. It is a time for each of us to determine how to respond to help protect our families. It is also a time for dentists to assess how they should respond to meet the additional demands placed upon them by way of their professional licenses and underlying responsibility to society. This article frames a set of commitments that the profession should consider assuming. It is related from the perspective of an institution that has taken an active role in societal protection from before Sept. 11, 2001, to the present.

The discussion includes a description of the nature of medical surge demand and why the dental profession is uniquely positioned to assist in meeting this demand. The skill set of the dentist is highlighted in terms of triage ability, a role in bio-surveillance, the capacity to calm the "worried well," and community responsiveness. In addition, concepts like shelter in place and the Medical Reserve Corps are explained, and valuable reference sources and websites are provided.

Bioterrorist actions, natural catastrophes, and emerging infectious diseases can quickly overwhelm existing medical capacity. Already challenged to near-capacity levels by economic drivers, there is little flexibility to expand medical care in response to surge demands resulting from natural or man-made events.

Surge demand usually arises quickly in unpredicted locations, placing great burden on the existing local or regional emergency system. During the early 2003 outbreak of severe acute respiratory syndromes, for instance, a hospital in Taiwan screened an average of 5,100 people per day, every day, for three months.[1] The "virus of fear" can be frightening, causing those not actually affected but concerned that they might be (i.e. the worried well) to seek treatment, further burdening the health delivery system. After a catastrophic event, particularly one involving bioterrorism or weapons of mass destruction,

Authors / Walter J. Psoter, DDS, PhD; is assistant professor, Department of Epidemiology and Health Promotion at New York University College of Dentistry, and associate professor School of Dentistry University of Puerto Rico.

Michael C. Alfano, DMD, PhD, is dean at NYU College of Dentistry.

E. Dianne Rekow, DDS, PhD, is chair of Catastrophe Preparedness Task Force, and director of Translational Research at NYU College of Dentistry.

The military has determined dentists are second only to physicians in their ability to triage patients in simulated mass casualty situations.

this is likely to place an extraordinary strain on the health care system. In response to the anthrax exposures in 2001, despite the fact that the Centers for Disease Control and Prevention identified only 22 cases of anthrax,[2,3] tens of thousands of people were taking prophylactic antibiotics, creating nationwide shortages of the drugs[4] and more than 1 million specimens were tested in various laboratories.[5]

Potential threats against hospitals in Chicago, Houston, Washington, D.C., and San Francisco have been made.[6] Losing one hospital, even in a large city with a number of other facilities could have a serious negative impact on access to care, even in its ability to respond to normal daily healthcare demands. Furthermore, some hospital emergency plans call for lockdown in response to threats,[6] further compromising the ability to respond. Additionally, many physician office complexes are clustered around hospitals, making them vulnerable as well. In the event of catastrophe, either man-made or natural, physicians themselves are also vulnerable to being affected. Of 19 people diagnosed with SARS in Toronto in 2003, 11 were health care workers.[7]

The existing medical capacity is functional — until there is a massive or targeted challenge to it. In the case of a catastrophic event, some day-to-day care might be able to be postponed, but initial attention focuses on life-threatening conditions and will continue to require ongoing supervision. Vulnerability of hospitals, physician's offices, and physicians themselves, complicated by the worried well seeking treatment, will compromise the flexibility and capability of the existing system. Clearly, a surge response resource is needed to fill this demand.

The Dentist as a Surge Response Resource

Although the NYU College of Dentistry had anticipated the vulnerability of New York City to a major terrorist event, and had even scheduled continuing education courses on the role of the health practitioner in terrorism preparedness as early as March 2001, Sept. 11 was a wakeup call for everyone. This galvanizing event served as an important teacher for NYU College of Dentistry and the profession about the role that dentists can play in catastrophe response. On that dreadful morning, some NYU students and faculty watched the towers burn and then collapse, others rolled up their sleeves and rushed to what was to become known as "Ground Zero." There, they irrigated the eyes of firefighters and treated minor trauma, while oral surgeons served as anesthesiologists for trauma surgeons. Faculty and staff joined the team at the New York City Medical Examiners Office to begin victim identification. The college donated X-ray processors and mounts, instruments, charts, and other supplies to facilitate that service. Finally, NYU dental students went to hospitals and temporary morgues to hand out masks, water, and to help comfort relatives searching for loved ones.

From observation and reflection of that experience, and the vast history of military dentists functioning as medics and triage officers on the battlefield, dentists do well what they are trained to do. Dentists are able to suture wounds, manage infections, prescribe drugs, control infection, take medical histories, interpret radiographs, and much more. Dentists could also benefit the response by counseling upset and uncomfortable patients. All of these skills are valuable in response to a catastrophe. Indeed, the military has determined dentists are second only to physicians in their ability to triage patients in simulated mass casualty situations.[8]

As highly respected members of the community, dentists, already well versed in understanding medical jargon, can "translate" that terminology into lay terms. That action can have a profound impact on reducing the fear, thereby reducing the number of worried well

Table 1

Preparedness Phone Numbers and Web Addresses

Resource	Phone Number	Web Address
Local Office of Emergency Management	311*	www.nyc.gov/oem*
Local Police Department	911 or (212) 741-4811*	www.nyc.gov/html/nypd/home.html*
Local Fire Department	911 or (212) 999-2222*	nyc.gov/html/fdny/html/home2.shtml*
Poison Control**	(212) 764-7667*	- - - -
State Office of Emergency Management	(518) 457-2200*	www.nysemo.state.ny.us*
Federal Emergency Management Agency (FEMA)	(800) 450-2520	www.fema.gov
U.S. Department of Homeland Security	(800) BE READY (800) 237-3239	www.ready.gov
Centers for Disease Control and Prevention	(800) 311-3435	www.cdc.gov

* Specific to New York City, local numbers should be substituted.

** Poison control has access to emergency medical services 24 hours a day.

who might seek and demand medical treatment although they do not physiologically need such. Moreover, a dental office can also be a valuable element in surveillance. If unexpected numbers of patients cancel appointments and they mention they have similar symptoms, alarms could be sounded to public health officers to investigate whether or not a biological event may be unfolding or a new infectious disease emerging, permitting earlier containment.

Nearly all dental procedures are elective. If a catastrophic event occurs, patients will not need veneers, crowns, or sealants placed that day. Thus, a substantial population of well-trained health-care providers is essentially immediately available and deployable, adding a major contribution to the surge capacity in the geography of highest demand. But how can one effectively become part of that surge capacity?

The Dentist as a Responder

A number of potential roles for dentists can be considered and are described later in this article. These range from effectively planning to help protect immediate family members, office staff, and patients, to more broad-based involvement in an organized community-based or national response team.

The Dentist as a Responder for Practice and Family

The impact of every emergency event can be reduced through careful planning, anticipating scenarios, and practicing responses. Every family and every practice needs to consider their response to two basic situations: those where you must leave your current location (evacuation as in the case of fire or explosion) or those where you must not leave your current location (shelter in place as in the case of a toxic chemical being released or a quarantine in response to release of a biological agent). If you need to leave, decisions should be made relative to where people should go, where they should meet, how you will know of peoples' locations and status, what paperwork you may need to gain access to your property when you return, regular and backup travel routes, etc.

If you need to stay, decisions should be made relative to how family members will know your condition and location, what supplies you will have on hand and how long you will be able to sustain the needs for variable numbers of people, etc. The NYU College of Dentistry has a shelter in place with supplies for 1,000 people for three days' time including meals, water, blankets, and light sticks. Additionally, there are 1,000 simple protective suits to provide a modicum of protection for people who feel obliged to leave the facility.

A number of guides are available to aid development of an emergency plan, including "Ready New York," offering suggestions appropriate for personal readiness in any urban area (www.nyc.gov/html/oem/html/readynewyork/preparedness.html). The Federal Emergency Management Agency also has a citizens' guide for emergency preparedness as well as publications focused on preparedness for small businesses (www.fema.gov/library).

Each office might consider having a list of biological agents of concern and information about their signs and symptoms. That information is readily

available from the CDC's website (www.bt.CDC.gov). That site also has links to downloadable fact sheets for patients that would be of value for risk communication to minimize fear. A 2003 article in the *Journal of the American Dental Association*[9] provides an additional quick guide to references for bioterrorism and catastrophe response.

A list of appropriate phone numbers to report a problem and websites to acquire additional information also should be compiled. An example of these is provided in **Table 1**.

Once a plan has been developed, it is critical that it be shared with other family members and practice staff. And, it should be practiced on a routine basis. While we will never be able to predict exactly what will happen should a catastrophe strike, if the groundwork has been laid, the response can be faster and more effective, minimizing the impact of the event.

The Dentist as a Responder in the Community

Effective community-wide response to a catastrophic event requires a coordinated effort, integrating volunteers with existing service systems such as police, fire department, emergency medical systems, and office of emergency response. A number of systems exist to facilitate this team effort. The American Red Cross has mobilized volunteers in disasters for more than 100 years. Founded by Clara Barton in 1881, it has earned international recognition for its humanitarian services. Details of how to become a volunteer are available at www.redcross.org.

The Citizen's Emergency Response Team was first developed and implemented by the City of Los Angeles Fire Department in 1985 and is now a part of the U.S. Department of Homeland Security's Citizen Corps initiative. CERT members are trained in basic disaster response skills including fire safety, light search and rescue, medical operations, and potential hazards during a response. The primary objective of the approximately 20 hours of CERT training is to provide decision-making and physical skills to offer effective and efficient immediate assistance to family members, neighbors, and associates without placing oneself in danger. More than 170 communities in 28 states and Puerto Rico sponsor a CERT program. A website, sponsored by the City of Los Angeles CERT volunteers, provides details and specific information about the local and sister programs (www.certla.com/index.htm). Additional information about CERT programs and training is also available through the FEMA website (http://training.fema.gov/EMIWeb/CERT/).

The Medical Reserve Corps is a specialized component of the Citizen's Corps with emphasis on providing assistance and depth to the existing local emergency teams and to augment public health initiatives. The mission of the MRC is to establish teams of local volunteer medical and public health professionals who can contribute their skills and expertise when needed in their community. In normal times, they help improve the public health infrastructure. In response to a catastrophe, they provide important human resources to the surge capacity in the critical first 72 hours of a response, before state and national resources can be mobilized and become effective. The volunteers are integrated into the local response team. Additional information about local MRC teams, including contact names for the effort, is available at www.medicalreservecorps.gov.

In New York City, the MRC is actively recruiting both dentists and dental students to participate in the teams. Should a catastrophic event occur, MRC volunteers would be called upon to participate in Point Of Distribution clinics. These clinics would be set up in large, non-hospital facilities that would permit mass vaccinations of large populations. For instance, during a smallpox epidemic in 1947, nearly 6 million New Yorkers were vaccinated in just over three weeks.[10] Using the POD model with MRC volunteers, the entire New York City population of 8 million could be vaccinated in four days. Similarly, if mass medication distribution is needed, with MRC volunteers working in PODs, 1,000 people an hour could be screened for level of disease and potential drug complications, and provided with the appropriate dosage and amount of medication.

> The impact of every emergency event can be reduced through careful planning, anticipating scenarios, and practicing responses.

In April 2004, the NYU College of Dentistry collaborated with the New York City Department of Health and Mental Hygiene, and the New York City school nurses in a POD drill. Emulating a tularemia exposure at a local mall, 250 students and faculty set up a POD. With only 45 minutes of training, they diagnosed the need for and dispensed medications in less than one hour.

New York City MRC participants can earn continuing education credits through on-line web-based courses offered by the New York City Department of Health and Mental Hygiene. The first course, just recently made available, addresses the response to smallpox. It consists of four parts: (1) a primer on the disease and its progression, (2) a description of how a POD would function in response to a small-

pox outbreak, (3) how to properly vaccinate people for smallpox, and (4) information about signs of vaccine administration and possible adverse sequelae.

Other roles for involvement of dentists include the Disaster Mortuary Operational Response Team, Emergency Medical Services, FEMA, and Red Cross volunteer activities. DMORT is involved with assisting in identification of the victims of a mass fatality incident, assuring that proper identification is made to permit closure for surviving family members impacted by sudden and unexpected loss of loved ones. Responsibilities often also include setting up temporary morgue facilities and providing mortuary services. Special training and certification is required. Although DMORT currently is fully manned, additional information about DMORT activities is available at http://oep-ndms.dhhs.gov/dmort.html.

EMS are provided by emergency management technicians (EMT) and paramedics who have special training. Certification must be renewed on a periodic basis (usually every two years). First Responders, the lowest level of EMT trained, have about 40 hours of special coursework; paramedics have at least 1,000 hours of coursework. Training and certification is under the direction of the National Registry of Emergency Medical Technicians. Specifics about training and participation are available at http://www.nremt.org.

Expanded Role for Dentists

Clearly, dentists can play an important role in catastrophe response through existing channels. There are, however, some emerging opportunities that could expand that role for those who are interested. Following a catastrophic event, dental offices could be used as emergency treatment sites. Dentists could pursue special training to expand their knowledge base to include principles of emergency medicine.

The Dental Office as a Treatment Site

When demand for medical services exceeds the existing resources (or existing facilities have been compromised by contamination or destruction), dental offices could be immediately converted to serve as treatment sites. There are 120,000 offices with 185,000 dentists in the United States. While there are four times more physicians than dentists, physicians often practice in groups. Thus, dentists contribute one-third of the non-hospital "physical assets" available for catastrophic response and, because their offices are distributed throughout the community, they are a less "appealing" target for terrorist acts.

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Dental offices typically are equipped with basic supplies needed to provide some level of care beyond that available in a home, though clearly they could not provide the entire spectrum of medical care that would be necessary. Converting to treatment sites would substantially add to the surge response capabilities and could be almost instantaneous if roles and operational integration are developed. This activity may be community specific as response plans and roles do become increasingly developed.

The Dentist as Triage Expert

Dentists have long been deployed as medics in the military and have been shown to be expert in triage, better than nurses and medics and second only to physicians.[8] NYU College of Dentistry is exploring the effectiveness of providing training to dentists and setting up triage offices for hospital emergency assistance and/or distribution points for health care delivery in response to catastrophic events. The willingness of emergency room physicians to accept dentists in this role is being assessed. Currently, three NYU faculty members are receiving 35 hours of specialized training in mass casualty/biological and chemical triage by an emergency room physician. The course focus is on physical diagnosis, concepts of triage, routes of exposure including biological, chemical, and radiologic agents, irritant gases and vesicants. The curriculum also covers concepts of decontamination, personal protective equipment, clinical syndromes associated with terrorism, plus the psychological aspects of weapons of mass destruction. The course culminates with 15 hours of exposure to the actual triage process in an emergency room. The "final exam" is to pass a triage scenario test. Based on their experience and the feedback from the emergency room physicians involved in the project, a formal curriculum for training dentists as triage officers may be developed.

Changing the Culture of the Profession

Few of us would have imagined that we would be concerned with our role in catastrophe response when we began dental school. In today's environment a dentist needs to be able to recognize illness or injury, institute steps to limit the spread of the illness, initiate appropriate treatment or refer the patient for treatment, and report information about certain injuries or conditions appropriately. This knowledge is, of course, no different from what we have always needed to know. What is new in

today's environment of constant vigilance for and fear of terrorist attacks is that there are new agents of concern that can induce new disease that we have probably never seen. We need to know how to become a contributing part of the response system, and we need to be particularly watchful for curious disease patterns, uncommon presentation of common diseases, or emerging patterns of unusual presentations and report them quickly. Since the quantity of material to learn is not large, but its importance to our survival may be huge, it should be possible to change the culture of the profession to desire to incorporate this new information into its knowledge base.

NYU College of Dentistry has integrated this new information into its curriculum, ultimately creating dentists who understand it and the necessary actions. But it has done so without making terrorism the focus of the courses. Instead, microbiology discussions of viruses now include the viruses on the CDC's list of agents; differential diagnosis includes discussions of the differences between chickenpox and smallpox. And practice management includes preparation of an emergency plan for the student's office. In the first year of dental school, students learn of the emergency response for safe operations within the college, including infection control procedures, what to do in case of a fire or if a shelter in place is needed. They also have a course in the ethical foundations of dentistry that raises their awareness about dentistry as a profession and some of the ethical dilemmas they will face in their practice. One of these includes the discussion of bioterrorism watchfulness and response.

In the second year of training, an 82-lecture hour course in general pathology and infectious diseases includes discussions about plague, anthrax, smallpox, botulism and other toxins, tuberculosis and other major infections, and viruses. Only 1.5 hours is devoted to bioterrorism, focusing on zoonosis (both natural and terrorist disease transfer to humans from animals): virulence factors of anthrax, plague, tularemia, and smallpox; and the most likely modes of dissemination of an agent in a bioterrorist attack.

The third year of oral medicine courses focus on differential diagnosis, issues, and complications associated with the smallpox vaccine. A practice management course in the fourth year of the training focuses on assessing the risk of a terrorist attack, tabletop exercises of potential scenarios, the role of the clinician in the community-wide response, and culminates in the creation of an emergency response plan for the student's own office.

What is new in today's environment of constant vigilance for and fear of terrorist attacks is that there are new agents of concern that can induce new disease that we have probably never seen.

NYU College of Dentistry is currently collaborating with five other colleges (the universities of Illinois; Florida; Michigan; Medicine and Dentistry of New Jersey; and Southern California) to share the existing materials and to expand curriculum materials to include content related to chemical, radiological, and explosive agents and events.

To explore expanding roles for dentists, NYU College of Dentistry has participated in a one-week program collaborating with the U.S. Army Medical Department Center and School at Fort Sam Houston, Texas. Dental and medical students (and this summer, nursing students) participate in didactic courses given by U.S. Army personnel, plus a field exercise practicing triage and decontamination procedures. Working as teams, this experience provides students from both professions an opportunity to better understand each other and exposes them to materials that are generally not available outside of the military. Both dental students and faculty have participated in this training. The students' enthusiasm about the training resulted in them creating a student group interested in exploring possibilities of short-term internships with the Department of Health; the fire, police departments; and the Office of Emergency Management. They have become a welcome addition to the response team for emergency preparedness within the college. And they provide a gentle but constant reminder to faculty to discuss the CDC list of potential bioterrorist agents, whenever it is appropriate, but possibly overlooked. The faculty participation has been equally valuable. It created a new awareness of diseases and how they spread. In feeling comfortable with the information, seamless integration of the topics flows into their courses without having to make it the primary focus of the discussions. The military is enthusiastic about continuing this activity because it provides important information to them about how civilians respond in emergency situations and how military-civilian teams can be effective.

Summary and Conclusions

Dentists are highly educated health practitioners who have skills that are relevant and applicable to catastrophic response, and they are almost immediately deployable. With only minimal additional training, they can become effective members of a community response team, substantially increasing the medical capability. As such, dentists will not only serve their communi-

ty, but they will also speed the process to quickly get their own lives, and their practices, back to normal. CDA

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To request a printed copy of this article, please contact / E. Dianne Rekow, DDS, PhD, NYU College of Dentistry, 345 E. 24th St., New York, N.Y., 10010.

Dentists Can Contribute Expertise in a Major Public Health Disaster

Joyce M. Galligan, RN, DDS

Abstract

Background and Overview: The time for dental professionals to educate themselves to respond to, and assist with, a catastrophic medical disaster is here. California dental healthcare workers must understand the various duties they may be asked to perform if a large-scale disaster were to occur. This article explores the various duties, which may need to be performed in the event of a medical disaster, and the duties a dentist, or dental auxiliary, may be able to complete, with minimal additional training.

Conclusion: California dentists must be educated, at minimum, to recognize the symptoms of exposure to biological agents or naturally occurring diseases, such as avian flu and SARs, in their patients. Dentists must be further educated to correctly counsel their patients who exhibit such symptoms. Finally, dentists must alert the appropriate public health authorities of such exposure.

California should consider amending the California Dental Practice Act to provide for the expansion of the definition of the practice of dentistry in the event of a declared healthcare emergency. The new definition should, at minimum, allow dentists to administer vaccines and dispense medications at a mass prophylactic distribution site. The definition could be further expanded to allow dentists to perform more complicated or invasive duties in the event of a disaster with large numbers of bodily injuries. In either event, California will also need to provide limited liability to dentists who do participate in emergency situations, similar to the Good Samaritan laws, which currently apply to physicians and surgeons.

Practice Implications: Dentists and their dental auxiliaries can augment the existing medical professionals, in responding to a declared medical emergency. In order to be ready to respond, dentists and their dental auxiliaries must receive additional training through continuing education courses developed specifically to train them in recognizing symptoms of exposure to biological agents.

Author / Joyce M. Galligan, RN, DDS, is a full-time assistant professor of clinical dentistry, directory of the medical emergency response team, and chair of clinical safety and Asepsis at the University of Southern California.

The Need

We live in a world in which individuals in various fields of practice must become educated regarding disaster preparedness. This need encompasses all dental healthcare workers, or DHCW. In March 2003, the U.S. Public Health Services and the American Dental Association co-sponsored the first of its kind conference, "Dentistry's Role Responding to Bioterrorism and Other Catastrophic Events." The U.S. Surgeon General, Richard H. Carmona, MD, opened the conference by asking the dental profession to assist the U.S. Public Health Service Office in the event of another major public health disaster in the country.

Carmona stated, "What if we have to immunize a lot of people because of an impending thereat. Could not dentists be involved? Could not dentists be involved in taking histories, screening patients, dealing with outpatient issues? Absolutely. I think we are on the very brink of how much dentistry can be involved as a response force as part of our partnership and team as we prepare our country for these inevitable threats."

The dental profession has a long history of lending assistance in fatal disasters, primarily via the work of forensic dentists and the assistance of dental members on Disaster Mortuary Operational Response Teams. While the work these dentists perform is invaluable, the number of dentists involved in these groups is minimal when compared to the number of licensed dentists. The dental profession, as a whole, including dental auxiliaries, should have the opportunity to become more involved in responding to catastrophic events.

As will be discussed later in this article, dentists are currently limited in the assistance they can offer in a public health disaster due to the existing limitations on the scope of practice. Dentists must begin to work, in concert, to accomplish a change in existing state laws so as to expand dentistry's role in the case of a catastrophic emergency.

Our state and our country cannot be too complacent. In a recent address to the National Press Club, Marsha J. Evans, president and CEO of the American Red Cross, commented on a study commissioned by the Red Cross, which concluded that approximately 60 percent of Americans were wholly unprepared for a disaster of any type. She went on to say that the Red Cross' emergency response division, the first wave in disaster response, is running a deficit and the government has not instituted any type of redundancy relief.[1]

Further, since Sept. 11, 2001, two-thirds of states have cut their public health budgets. In addition, the proposed 2005 federal budget will cut more than $105 million in integral programs to the nation's health defenses, including state and local bio-terrorism preparedness support to all our states. These cuts have occurred during a period of increasing terrorist threats, the recent discovery of a poisonous biological agent (ricin) within the nation's capitol, mad cow disease in the state of Washington, the SARS epidemic in Asia and Canada, and the evolution of the Avian flu.[2]

In recent years, there has been an increase in biological scares. In October 2001, an unidentified individual or individuals sent weapons-grade anthrax spores through the United States mail. Nationally, 22 citizens were infected and five people died from exposure. The effect of the anthrax scare on the public sent panic rippling across the nation. The nation's capital came to a halt for several days. Americans went to their physician or dentist's office asking for prescriptions for Cipro, even though they were in no danger of having been exposed to anthrax.[3-5] According to NDCHealth, an Atlanta-based healthcare information services company, more than 639,000 Ciproflaxacin prescriptions were filled at retail and online pharmacies in the first two weeks of October 2001 at the height of the scare.[6]

Dentists are well-educated professionals with significant scientific and medical backgrounds, and for various reasons, are often overlooked as a resource.

It is apparent we must find the means to increase the number of citizens prepared to assist in a full-scale emergency, as our governments, both federal and state, do not seem to have the resources to devote to increasing preparedness. The dental profession has the personnel resources to help augment a public health response in the event of a major catastrophe.

Dentists are well-educated professionals with significant scientific and medical backgrounds, and for various reasons, are often overlooked as a resource. This problem needs to be addressed, particularly in light of the projected demand for assistance in the event of an emergency. The number of medical doctors and registered nurses in California has diminished over the past few years. There are currently 280,653 licensed registered nurses and 115,354 licensed physicians and surgeons in California.[7] The state's economic development department forecasts California's nursing shortage will hit 30,000 by 2006 and balloon to

110,000 by 2010.[8] A study performed by MGT of America, projected a shortage of physicians in the U.S. would become evident by 2002 and become increasingly problematic until at least the year 2020, when the annual shortage could be as much as 12,000 physicians.[9] These projections do not paint an encouraging picture, nor do they take into account the large number of medical professionals who would be needed in the event of an emergency.

Possible Roles for Dental Personnel

If the projections are correct, then alternate healthcare providers will be needed to augment a U.S. Public Health Service's call for assistance in the event of a major catastrophe. Dentists comprise of a group of professionals, who, with minimal additional training, could become additional resources to aid in a disaster response. According to the Dental Board of California, there are 28,227 licensed dentists; 29,345 RDAs; and 13,010 RDHs in California.[7] According to the U.S. Census Bureau, there are approximately, 168,000 dentists; 218,000 RDAs; and 112,000 RDHs in the country.[10]

The shortage of medical personnel will have a direct impact on California's ability to respond to a disaster. To illustrate, if the county of Los Angeles was stricken with a smallpox outbreak and a mass vaccination project was called for, it is questionable that LA County's medical professionals would be sufficient in numbers to adequately respond in a timely manner. Los Angeles County Department of Health Services estimates that to vaccinate the entire population of the county (approximately 10 million people),[11] it would take Los Angeles' licensed medical professionals a minimum of 30 days, working 24 hours a day. This assumes that mass vaccination clinics would be operated in 50 LA County locations; operate 24 hours a day, seven days a week. An estimated 10,170 staff would be required to operate the clinics. The staff would include 150 clinic managers, 150 supply managers, 1,350 vaccinators, 1,350 vaccination assistants, 3,375 screeners, 3,375 triage/registration/education and 420 data entry personnel. This is based on three shifts of staff (at eight-hour shifts) in a 24-hour time period. This estimate does not include the more than 1,300 non-medical personnel needed to handle the mechanics of crowd and traffic control and management of the transportation of staff and equipment.[12]

If every dentist, hygienist and registered dental assistant in the county of Los Angeles helped during a mass vaccination clinic, as many as an additional 14,856 people would be available. According to the state Dental Board, there are 7,782 dentists (compared to 25,599 physicians and surgeons); 2,203 registered dental assistants; and 4,871 registered dental hygienists in Los Angeles County.[7]

If every dentist, hygienist and registered dental assistant in the county of Los Angeles helped during a mass vaccination clinic, as many as an additional 14,856 people would be available.

According to the LA County Department of Health Services, a "medical screener" would assess clients for contraindications to vaccinations and refer clients who have a contraindication to the vaccine to an on-site physician for a physical exam. A medical screener should also have good interviewing skills and be knowledgeable about exposure risks, medical contraindications to vaccination, risks of vaccination, and risk-benefit analysis. If necessary, medical screeners would review the list of normal or expected reactions to the vaccine with the vaccine recipient. Medical screening personnel would contact a designated physician consultant to help decide whether to vaccinate. If the vaccine were still on Investigational New Drug status, medical screening personnel would ensure that the consent form is understood and signed by the potential recipient.[12]

The vaccination assistant would help the vaccine administrator with all aspects of pre- and post-vaccination, ensure that vaccination stations maintained adequate supplies, instruct recipients on location of where they would receive a vaccination, help prepare recipients vaccination sites, (roll up sleeves, remove arm from shirt/blouse, etc …), clean vaccination sites, if necessary, apply dressing and explain about changing the dressing. Vaccination assistants would be responsible for entering the vaccine and diluent lot numbers on the patient's consent form and clinic record and provide the vaccine recipient with a vaccination card that documents when and where the vaccine was administered.[12]

A vaccinator would oversee the vaccination process, reconstitute the vaccine, give vaccinations, sign the clinic record, and watch for immediate reaction or complications. Vaccinators would be skilled with diluent, vaccination techniques, methods to prevent contamination of the vaccine, exposure risks, the medical conditions that constitute contraindications, the risks of vaccination, preparation of the vaccine site, normal and abnormal post-vaccination responses, and follow-up care of the vaccination site. Vaccinators would

also respond to medical emergencies that may occur in the clinic.[12]

The duties, as set forth above, are of the type typically incorporated in the daily work activities carried out in dental offices. Dentists and hygienists review patient's medical histories, obtain medical consults when necessary, administer injections, watch for adverse events, respond to medical emergencies and provide patient education, every workday. Also, dental assistants work along side dentists during procedures, as well as prepping the operatory for dental procedures. These are skills that can be easily adapted to assisting a dental coalition team during a major public health crisis.

Additional Roles for Dentistry

It is apparent that DHCW are more than capable of performing the above listed duties. Further, with limited additional training, the entire DHCW workforce could be mobilized to augment the existing medical work force and ensure the citizens of California could be assisted in a timely and efficient manner. It is likely that the training requirement for all DHCWs could be met via annual continuing education classes.

We need only to look at the federal government's use of its military dental personnel for examples of the means of expanding the roles of DHCWs in an emergency. Dentists in the military perform expanded duties, such as triaging victims, suturing lacerations, and decontaminating people exposed to harmful biological, chemical, or nuclear agents. Military dentists are cross-trained to respond as a medic, in addition to performing dental procedures.

According to a study, military dentists came in second, only to general medical doctors, in their ability to correctly triage and treat injured individuals in a mass casualty situation. The triage performance of the dentists was equal to that of the military surgeons.[13,14]

Raffi Najarian, DDS, an Air Force Reserve officer who recently served at an airbase in the United Arab Emirates, worked as a triage officer the first two-and-a-half months of his tour of duty. During the last two months of his tour, he performed "typical" dental procedures on the soldiers on the base.

During his time as a triage officer, he would meet planes that had landed with injured soldiers and triage the individuals, determining the order of those to be treated. He was also in charge of all the antidotal kits used to treat soldiers exposed to certain harmful agents. In addition, he ran the decontamination unit that would be responsible for "de-sliming" an individual exposed to a harmful biological, chemical, radioactive, or nuclear agent.

The officer felt he was well prepared to serve in this expanded role during his service, due to the training he had received in the Air Force Reserves. The military sends all dentists for chemical, biological, radiation, nuclear, and explosive (CBRNE) training. For example, an Air Force Dental reservist must attend Expeditionary Medical Emergency Support Squadron CBRNE training every four years. The training sessions last 10 days. In addition, the at-home "reservist" stations conduct trainings as well. The home station provides mock drills during one of the weekends to which the reservists must report (one weekend a month, two weeks a year). During the training, jets and other planes fly over the camp, as commanding officers announce the camp is under attack. The attack could be any of the CBRNE scenarios. Volunteers are given mock injuries and the dental crew must triage and treat the volunteer victims.

The Air Force reservists also have annual classroom training which discusses different CBRNE scenarios, the signs and symptoms of exposure to CBRNE agents, and the manner in which to triage and treat each exposure.

Obviously, this type of intensive triage training for general civilian dentists is too extreme. It does, however, highlight how, with minimal additional training, dentists can expand the scope of their practice in an emergency situation, thereby freeing up the services of others who may be able to offer a different type of assistance.

Interested local dental societies should inquire with military branches to determine if civilian dental personnel could be included in triage training.

Last year, the U.S. Army Medical School and Center in San Antonio, Texas, hosted a one-week training triage session for a class of six dental students, four medical students, and four faculty members. The Army medical school has expressed an interest in expanding this type of training. The class was offered at no charge to its participants. The only expenses incurred by the trainees were travel, food and lodging.

Until a concrete agreement between a civilian dental group and the Army Medical School has been arranged, dentists may want to get their first triage experience, (from a dental perspective), by attending a triage training class by the Academy of General Dentistry. The Academy of General Dentistry offers a two-day continuing education course at their annual meeting. The class covers the history of bioterrorism, signs and symptoms of bioterrorism agents that have the highest probability of

use, legal/liability concerns of responding to emergencies, principles of triage and casualty management.[15]

Interested local dental societies should inquire with military branches to determine if civilian dental personnel could be included in triage training. The U.S. Army Medical Research Institute of Infectious Diseases and the U.S. Army Medical Research Institute of Chemical Defense jointly conduct the six-day Medical Management of Chemical and Biological Causalities course eight times a year. The class is also available via distance-learning products, including satellite broadcast, video teleconference, and videotape series.[16] The course is approved for CE credits for MDs and nurses. It is possible if a dental society or dental association co-sponsored the class, dental CE credits could apply.

Legal Issues

Assuming dentists can, with a minimal amount of extra training, become sufficiently knowledgeable regarding responses in an emergency, the current California Dental Practice limits a dentist's scope of practice. Under current law, a dentist is prohibited from administering vaccines or dispensing medications at a mass prophylactic distribution site, or at any site. The practice of dentistry is currently defined as follows: "the diagnosis or treatment, by surgery or other method, of diseases and lesions and the correction of malposition of the human teeth, alveolar process, gums, jaws, or associated structures; and such diagnosis or treatment may include all necessary related procedures as well as the use of drugs, anesthetic agents, and physical evaluation."[17]

It appears the current definition of dentistry in California does not protect dentists from liability nor allow dentists to help in a mass vaccination inoculation, or assist and dispense medications in a mass prophylactic antibiotic clinic. The California Good Samaritan Law does not offer dentists immunity in responding to a major public health disaster.

Legislative action enabling dentists to respond to a major public health disaster would be required if dentists are to be allowed to assist in a catastrophic event. The longer the delay in the expansion of the role a dental professional can play in a major public health disaster, the greater the potential for a shortage of trained professionals needed in an emergency.

The California Good Samaritan Law does not offer dentists immunity in responding to a major public health disaster.

In order for the profession to be involved, dentists, as a group, need to be proactive and lobby to change the roles they are allowed to fill during a major public health disaster. The dental profession must believe, as a whole, that the profession has an expanding role, to be viewed as true healthcare providers, as opposed to a cosmetic enhancing profession.[18] Dentists must believe they can be valuable assets to a U.S. public health response before the dental profession will be able to move forward and clearly outline the definition of the expanding role dentists can serve in a major disaster.

Recent Developments

It is interesting to note in the time since September 2001, only one state mandates a bioterrorism continuing education requirement for dentists. Nevada requires that all current licensees, both dentistry and dental hygiene, must complete a required four-hour course on bioterrorism by June 30, 2005. New licensees in Nevada will have two years from the date their licenses are issued to complete the required continuing education course.[19]

Only a handful of states have addressed the possible relief from liability and licensure for dentists as it specifically relates to the expansion of their professional services in the event of a disaster. Bills are under consideration in Maryland, Washington, D.C., and Virginia, which would allow dentists to respond in the limited period of a disaster. Wisconsin, Pennsylvania, and Illinois, each have legislation pending which would allow for a limited expansion of the scope of a dentist's practice, thus enabling dentists to render care and treatment during a major public health crisis according to Albert Guay, DMD, chief policy adviser for the ADA.

While changing California's laws may seem daunting, it is possible. We need look no further than California's pharmacists. Approximately four years ago, pharmacists lobbied to change their practice act to allow them to administer vaccines. Pharmacists in California are now allowed to administer all types of vaccines, except for yellow fever. The legislation provides that the immunization protocol does not have to be patient specific, as is the case with disease state management. Rather, for immunizations, when one doctor signs the protocol, the pharmacist is allowed to administer vaccines to any patient who meets the screening criteria according to Peggy Hon, PharmD, clinical coordinator, USC Community Pharmacies.

According to Hon, all California pharmacy students have received CPR training as well as training in the administration of vaccinations for the past four years. For those who graduated prior to the curriculum change, training programs are available on a regular basis through state organizations and conferences. In addition, many

chain pharmacies require their pharmacists to attend company-paid training programs so they will be able to provide immunizations. In the past two flu seasons, pharmacies have been heavily advertising the fact they can provide annual flu vaccines. Of course, pharmacists view this as an additional source of income for their practices, as well as a service to the public.

Dental professionals and local dental societies should contact their respective community response teams if they are interested in being involved in disaster preparedness. In Los Angeles, the Medical Reserve Corps is recruiting volunteer members (retired medical doctors, registered nurses, and physician assistants), according to Ray Goodman, MD, MPH, medical director, Medical Reserve Corps of Los Angeles. Goodman is interested in adding dentists to the reserve corps if the California Dental Practice Act (or other form of legislation) is amended to provide that dentists may administer vaccines or dispense prophylactic medications in a major public health disaster. Again, the need to change the definition of a dentist's scope of practice is imperative if dentists are to be allowed to assist with a major health disaster.

The Los Angeles Medical Reserve Corps plans to go out into local communities and provide public health services by educating members of the community on the manner of preparing and protecting themselves in the event of a major public health disaster. The corps members will also assist in the county's response plan in the event a mass inoculation, or mass medication dispersal notification, is requested. The corps plans to offer training sessions on inoculations for various agents, in addition to participating in mass prophylactic drills scheduled in the greater Los Angeles region.

Dental professionals can be a great additional source to the Medical Reserve Corps' volunteers. As discussed with respect to augmenting the medical profession in the event of a disaster, dentists know how to educate their patients in prevention of dental diseases. With minimal additional training, dentists could also educate people regarding disaster preparedness. Dentists can also assist in mass prophylactic or vaccination clinics if legislation is passed allowing dentists to respond in the event of a major public health disaster.

According to an ADA consensus meeting titled "Workshop on the Role of Dentistry in Bioterrorism," dental professionals may be able to augment and assist medical and surgical personnel in providing definitive treatment for victims of bioterrorist attacks.[3] The meeting concluded that some of the services dentists could provide in an emergency (with minimal additional training), include:

Box 1

Epidemiologic Clues to Potential Terrorist Incidents

1. Large numbers of ill persons with a similar disease or syndrome.
2. Large numbers of cases of unexplained diseases or deaths.
3. Unusual illness in a population (e.g., renal disease in a large population may suggest exposure to a toxic agent such as mercury).
4. Higher morbidity and mortality in association with a common disease or syndrome or failure of such patients to respond to usual therapy.
5. Single case of disease caused by an uncommon agent (smallpox, pulmonary anthrax).
6. Multiple disease entities in the same patients, indicating that mixed agents have been used in the attack.
7. Apparent aerosol route of infection.
8. Illness limited to fairly localized or circumscribed geographical areas.
9. Low attack rates in personnel who work on areas with filtered air supplies or closed ventilation systems.
10. Sentinel dead animals of multiple species.
11. Simultaneous clusters of similar illness in noncontiguous areas.
12. Ill persons who seek treatment at about the same time (point source with compressed epidemic curve).
13. No illness in persons who are not exposed to common ventilation systems (have separate closed ventilation systems) when illness is seen in persons in close proximity who have a common ventilation system.
14. Several unusual or unexplained diseases coexisting in the same patient without any other explanation.
15. Atypical disease transmission through aerosols, food, or water, which suggest deliberate sabotage.
16. Stable endemic disease with an unexplained increase in incidence (i.e., tularemia, plague).

Information from Department of Health Services, County of Los Angeles Emergency Health Services Agency, www.labt.org.

■ Treatment of cranial and facial injuries

■ Provide or assist in administration of anesthetics

■ Perform appropriate surgery and suturing

■ Take and review medical histories

■ Assist in stabilizing patients

■ Provide CPR or utilize a semi-automatic external defibrillator

■ Administer vaccinations at local mass disaster vaccination clinics

■ Dispense mass prophylactic antibiotics at local disaster clinic sites

The City of Glendale's Metropolitan Response System along with the Los Angeles County Department of Health Services, the California Emergency Medical Services Authority, and the Department of Homeland Security conducted a free mass distribution site training exercise for healthcare personnel Oct. 8, 2003. The goal of the training was to educate, train, and inform those individuals who may be called upon to work with the local community team in the event it becomes necessary to provide antibiotics to the community. The four-hour training session had experienced professionals taking attendees through the process of what goes on at a mass distribution site, explaining what happens, where problems develop, and lessons learned from previous mass distribution exercises and events that have taken place in the U.S.

If a dentist wants to volunteer at a mock antibiotic dispensing clinic, it will take about eight hours in addition to the four-hour pre-training session. In November 2002, the University of Arizona College of Pharmacy's Bioterrorism Task Force joined with local, state and national agencies at a conference addressing bioterrorism. The event included a simulated bioterrorism event, the arrival of a portion of the National Pharmaceutical Stockpile, and a mass dispensing clinic involving college faculty, students, staff and alumni, as well as pharmacists and pharmacy technicians from across Arizona. The goal of the clinic was to dispense a 10-day supply of antibiotics to 1,000 people in six hours. The dispensing clinic ultimately processed more than 1,800 people during the six hours.[20]

Concluding Recommendations

In order to expand the role of dentists in a declared health disaster, the California Dental Practice Act will need to be amended to allow dentists to fulfill new duties. The expansion of duties issue is a two-tiered one; (1) expand the Act to allow dentists to administer vaccinations and dispense antibiotics, and (2) expand the Act to provide that in the case of an emergency which includes great bodily injury, (one in which the emergency is more than a biological disaster), dentists can assist with more invasive procedures, such as triage and suturing.

In any event, in order to become an additional resource in the fight against terrorism, dentists need to be educated, at minimum, regarding the symptoms of exposure to those agents deemed the most likely to be used in a terrorist event. This type of education does not need to assume a dentist's role would be expanded in an emergency situation. Dentists see patients on a daily basis. If a patient exhibits signs of exposure to a biological agent, a dentist must have sufficient basic education to recognize that fact and refer his or her patient to the appropriate medical professional, and alert the appropriate government agency of the exposure.[4,13] As demonstrated in 2001, most healthcare professionals had never seen a patient with exposure to anthrax. The individuals who were among the first to be exposed were not given immediate medical attention, and as a result, some of them died.[4]

Mandatory continuing education on the topics of medical disasters and bioterrorism should be instituted. The continuing education requirement should provide that all licensed dentists attend a bioterrorism preparedness class. The frequency of the course should be a minimum of once every two years in order to keep them abreast of recent developments in the field of biological agents. In addition, dentists should take it upon themselves to do some basic preparedness training in their own offices. Such training should include keeping a list of emergency telephone numbers, which should include the number of their local and state public health offices, and the federal public health department. If dentists are to be sentinels and inform public health officials of suspicious medical or dental occurrences in their dental offices, then dentists must be prepared (see **Box 1** for clues to potential terrorist incidents). Finally, dentists should educate their own staff members regarding emergency procedures, so everyone understands what procedures they are to follow in the event of a specific type of emergency.

As demonstrated in 2001, most healthcare professionals had never seen a patient with exposure to anthrax.

If you are interested in further information regarding bioterrorism, Johns Hopkins and the Centers for Disease Control have both established bioterrorist alert networks. The sites are free for all healthcare practitioners. To join the alert networks, visit www.hopkins CBN.org and www.bt.cdc.gov CDA

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To request a printed copy of this article, please contact / Joyce M. Galligan, USC School of Dentistry, 925 W. 34th St., Den 235, Los Angeles, Calif., 90089-0641

Robert E. Horseman, DDS

Fight, Flight or Bite

No one can deny that the public's exposure to dentistry is comprehensive and intense. It would also be difficult to deny that most of this exposure is the result of profit-driven companies such as Colgate-Palmolive and Procter & Gamble fighting the gingivitis/plaque/minty-breath wars in the public forum and promoting their own products and agendas. The newest buzzword is "triclosan," an ingredient common in antibacterial soaps. The FDA says that nobody yet knows just how triclosan works inside the mouth, but no matter, it will soon be as ubiquitous as fluoride. That these campaigns probably account for 75 percent of the tab for toothpaste is also not to be denied. And that's why even the most beef-witted amongst us is acutely aware of the nebulous benefits of baking soda, angled toothbrush handles, and the elusive chimera of the perfect smile.

Teeth are the most durable parts of the human body, with the possible exception of crow's feet and love handles.

Lost in all this hoopla is one of dentistry's major contributions to modern civilization. Teeth are the most durable parts of the human body, with the possible exception of crow's feet and love handles. They are able to survive fire, flood, and massive infusions of Sugar Daddys, Gummi Bears and Jujubes when all else is reduced to fine ash.

Because of this durability, identification of victims of murder, mayhem and mass disasters has been greatly facilitated. The atrocities involving Jeffrey Dahmer, the Oklahoma City bombing, 9/11, and various airplane crashes and British soccer games have showcased the contributions of a branch of dentistry devoted to sorting out the who's who of these tragic events.

Those dentists dedicated to this facet of the profession are called "forensic dentists," and their ranks and expertise are growing. The importance of this contribution to the public was officially recognized in 1976 when the National Institute of Law Enforcement and Criminal Justice helped organize the American Board of Forensic

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The last thing forensic dentists need is a growing number of nutters exercising their occlusion on a hapless public.

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Odontology. Members of the ABFO are the people who come in after a tragedy, sift through the detritus and try to match, say, an MOD in No. 3 to one of 380 million candidates. The mandate was to identify forensic scientists qualified to provide essential professional services for the nation's judicial system and law enforcement agencies. There was a further objective to establish standards of qualifications for those who practice forensic odontology.

The American Dental Association has assisted with the training of forensic dentists by holding mock disaster drills, such as the National Symposium on "Dentistry's Role and Responsibility in Mass Disaster Identification" held in Chicago. Under the tutelage of Dr. William Morlang, more than 150 dentists attended the two-day courses learning how to obtain the essential skills necessary to better contribute to a dental forensic team.

Curiously, a contribution has recently been made by a hitherto untapped source. There is a certain quixotic element of our population dedicated to the coining of new words and phrases, bestowing upon the originator a certain cachet among the cognoscenti. That some of these originations turn out to be socially unacceptable, inane, or downright stupid is of no matter. The point is to start a trend, see it ignite with the intellectually underendowed, and then move on quickly.

A case in point is the phrase "bite me." The vocabulary-challenged individual who utters this does not actually wish to be bitten, but believes the *bon mot* to be an update of "nuts to you" only cleverer because of its ambiguity. Unfortunately, another element of the population, whose mental faculties are the subject of psychopathology seminars, takes the phrase literally.

Thus, we have the spectacle of Mike Tyson, a carnivorous primate of otherwise impeccable manners, scalloping the ear of Evander Holyfield. Even more, a lady of delicate sensibilities claims to have been chomped in an important part of her anatomy by berugged sportscaster Marv Albert, who was then allowed to paint himself as a victim on several national talk shows while wearing his own underwear.

The last thing forensic dentists need is a growing number of nutters exercising their occlusion on a hapless public. On the upside, the dentists don't have to spend long hours piecing together shreds of evidence trying to figure out what happened and to whom. Sometimes these "bite me" advocates, whether their depredations are done in passion, anger or in jest, at least have the decency to activate their incisors in the public eye, leaving no doubt as to "whodunit," only *why*.

Judges now face the problem of what to mete out as a suitable sentence for episodes of this nature. If they believe that punishment should fit the crime, we advise them to recommend the extraction of the anterior teeth of the defendant — anesthesia optional. If, after a suitable period of rehabilitation is completed successfully, berths with the Toronto Edentulous or the Detroit Gummers might be available. Failing that, an option of restoring the missing teeth with a clasp-less flipper at his expense, could be offered.

Should this ever come to pass, the old expression of "putting the bite" on someone as in "Can you spare a tenner until payday?" will revert to the simple appeal for a loan it once was. CDA