

Dr. David Sweet: Canadian Forensic Odontologist Makes an Impression on the Global Scene

Canada is quickly establishing itself as a world leader in disaster victim identification (DVI) and forensic odontology. Although he would never take credit for this country's increasing influence, Dr. David Sweet of Vancouver has been one of the driving forces behind Canada's achievements in this highly specialized field.

After joining the University of British Columbia faculty of dentistry in 1984, Dr. Sweet was asked to form a forensic dentistry study club in 1992. His aim was to train fellow dentists in forensic science disciplines with the ultimate goal of developing a mass disaster response team for western Canada. The team, known as the B.C. Forensic Odontology Response Team or BC-FORT, now comprises 81 members, about half of which are dentists from B.C., Alberta, the Yukon Territories and Nova Scotia.

Dr. Sweet is also the chief forensic odontologist for British Columbia, doing casework for the Coroners Service that involves the identification of deceased persons using

traditional forensic dentistry methods. The Bureau of Legal Dentistry (BOLD) lab at UBC is where this work takes place. As the founder and director of BOLD since its inception in 1996, Dr. Sweet has developed the lab into an international centre of excellence in forensic odontology that is now a recognized resource for local and visiting scientists.

Dr. Sweet is uniquely qualified in both forensic medicine and traditional forensic dentistry. This combination allows the BOLD lab to cross over into all the various disciplines involved in forensics, including DNA analysis techniques. In just over 10 years of existence, the lab has pioneered world-leading technology and methods to collect evidence that are used by police forces and authorities around the world.

Bold Innovations

The first technique involves the analysis of human bite marks. In most violent assault cases, teeth are used as a weapon when attacking or defending. The linkage of 2 people at a crime scene is vital and requires a physical comparison of the marks on skin to the teeth of the suspect or victim. Members of the BOLD lab developed a computer program to examine the biting edges of teeth in an objective way, rather than the subjective methods that were used in the past. "The reliability of this objective bite mark analysis has been proven in several scientific studies as well as in courts of law where Canadian precedents have been set. I believe it is seminal work on bite mark analysis," explains Dr. Sweet.

The second innovation deals with DNA and saliva deposited on skin. When it became evident within forensics that DNA from small amounts of saliva, such as that found on envelopes or postage stamps, would be sufficient for analysis, Dr. Sweet hypothesized that there would be similar amounts of saliva deposited during kissing, licking or biting. "During my PhD research, I developed a technique to retrieve this saliva off skin without getting contamination from the skin's DNA," he explains.



Dr. Sweet and BOLD's DNA analytical officer Diane Fairley use the "Sweet Swabbing" technique on a coffee mug recovered from a crime scene. Photo: Dr. Leon Woolf.



Dr. Sweet at the BOLD lab. The freezer mill shown in the photo is used to cryogenically prepare a bone sample for DNA extraction. Photo credit: Dr. Leon Woolf.

“This new swabbing method employs 2 swabs, where a wet swab is used to wash the skin followed by a dry one to collect the moisture.” This technique is now the gold standard in forensics and is referred to as “Sweet Swabbing.” Similarly, the bitten areas are named “Sweet Spots.”

The third innovation stemming from the lab involves the extraction of DNA from hard tissue. A freezer mill with liquid nitrogen is used to make teeth or bone samples extremely brittle. Dr. Sweet provides more detail: “A magnetic field pulls a plunger back and forth with changing polarity of the magnet to impact against the tooth, and every time it makes contact, the tooth shatters. From a whole molar tooth that has DNA imbedded deep inside the dentin and cementum, this method produces a powder, which essentially brings the cells close to the surface of those particles. The cells can then be opened up to allow DNA to be extracted and analyzed.”

This method of DNA extraction is now one of the hallmarks of the lab. Most bones and teeth found in Canada are sent to the BOLD lab to take advantage of this technology.

Tragedy in Thailand

Members of the BC-FORT team have been called upon to employ their forensic expertise in many high profile cases, often as expert wit-

nesses. One of the most detailed DVI effort they participated in occurred after the tsunami that devastated Southeast Asia in 2004.

Interpol and the Royal Thailand Police Force brought together forensic experts from over 30 countries to help recover and identify victims. In Canada, the RCMP established the Tsunami Missing Persons Task Force, and Dr. Sweet was asked to participate at the request of the task force and the Department of Foreign Affairs.

As the Canadian odontology team leader and a member of the Interpol Scientific Advisory Subcommittee, Dr. Sweet helped with all facets of the dental DVI response, including recovery, analysis and comparison of dental records from the home countries to dental records recovered from the found human remains.

“Canada was a leader in Thailand,” he acknowledges. “The background and skills of our people were considered some of the best in the world. Response administrators from other countries assigned many Canadian odontologists to positions of authority during the mission.”

With the assistance of provincial dental organizations and police task force members who contacted next-of-kin, antemortem dental records were recovered for each of the Canadians who were reported missing. “Dental records were the primary form of identification so they were extremely important,” says Dr. Sweet. “In this tragedy, an even higher number of victims than usual were identified from dental records due to the quality of records that were available from so many countries.”

Dr. Sweet is proud of the 15 dentists who each took a tour of duty during the response. One particularly memorable event involved an x-ray developer that malfunctioned and for which replacement parts were nowhere to be found. Dr. Bill Inkster of Delta, B.C., one of the members of BC-FORT, phoned Dr. Sweet in Vancouver to see if the Canadian government could provide a new developer. To avoid any further delays, Dr. Inkster offered to pay for it personally if need be.

“This exemplifies the Canadian attitude in these situations. If there is a problem we try to find solutions,” recalls Dr. Sweet. “Canadians have a reputation of going about our duties in a quiet, unselfish way, while being very effective at problem solving.” The Department of Foreign Affairs agreed to reimburse the costs that were incurred for purchasing the x-ray developer.

When their time in Thailand was coming to close, members of the Canadian DVI team donated the x-ray developer to a hospital dental

clinic in Phang Nga province. The Canadian team also donated dental treatment to their local driver and an embassy clerk, both of whom had helped team members immensely during their stay in Thailand. “Donating equipment and helping the local people in Thailand, this was done in a way that only Canadian dentists would,” notes Dr. Sweet.

Dental Records and Victim Identification

“The dental profession can be very proud of the role dentists can play in helping to identify deceased persons,” says Dr. Sweet. He explains how colleagues always display concern and empathy when called upon to provide patient records. “When we identify the name of a missing person to the dentist, they often have a personal connection with the victim since they have been treating them for a number of years,” he explains. “Dentists are always more than happy to provide whatever assistance they can, because they usually know the next of kin.”

While some colleagues may be reluctant to disclose original patient records, Dr. Sweet stresses

the importance of these records to ensure that colour entries are not lost and that right-left orientation markers on intraoral radiographs are visible. “If dentists can provide us with the opportunity to see original records and use them for identification purposes, we will always return them,” he emphasizes. “In most instances, the use of original records specifically for forensic identification purposes is acceptable to provincial regulators, so I would encourage dentists to release these records in such cases.”

Dr. Sweet recommends that dentists duplicate their records and submit originals to the authorities. “Dentists can also record the date, time and to whom the records were released,” he says. “This can be in the form of a simple release statement that you ask the police officer to sign.”

Financial Concerns

Funding is an important issue that Dr. Sweet must continually tackle, as research into death and forensic science is generally not supported by traditional medical or dental granting agencies. “I spend more time trying to raise funds than I do at the bench at the lab developing research initiatives,” he laments. “The lab also benefits from private donations from dentists and others, and this is becoming more important as other crucial sources of research funds are unavailable.”

It can be a great challenge trying to convince government officials of the need to plan, train and especially equip DVI teams so that they can be prepared. “Quite typically what happens is that dental teams train themselves over a period of time with little or no resources,” he explains. “Yet when an event occurs and a response is needed, a budget appears seemingly from nowhere and authorization is given to get what we need. The problem is that this is not the time to go shopping.”

The BOLD lab has developed a unique business model that relies on fee-for-service casework. Dr. Sweet’s team of forensic dentists respond to a pager to perform forensic casework and donate their fees to the lab. The lab charges for DNA analysis or for a dental record identification and invests this money back into research projects for graduate students.

Dr. Sweet is grateful that these dentists willingly donate their fees to the BOLD lab and for the support he receives from UBC toward his endeavours. “I am fortunate to work at an institution recognized as one of the world’s top 40 research universities,” he says.



Dr. Sweet was named chief scientist for Interpol’s Disaster Victim Identification division during its annual meeting in Lyon, France, in May 2006. Photo credit: Staff Sergeant Kevin J. Miller, RCMP Forensic Identification Directorate.

Forensics Frenzy

With the proliferation of forensic science in the popular media, fuelled by the omnipresent *CSI* television franchise, Dr. Sweet has seen an increased interest in forensic dentistry, both from audiences at CDE courses that are better informed about modern forensic methods and by potential undergraduate and graduate students who want to know more about the discipline. “There is definitely a ‘CSI-effect’ in my work,” notes Dr. Sweet. “This includes some police investigators who are surprised by how long certain analyses take and by jurors when I describe the limitations to some methods.”

Dr. Sweet currently offers CDE courses through BOLD — including Disaster Dentistry and Operation DENT-ID. “At the training courses, we teach team members how to problem solve and how to manage the many and varied problems that can present themselves to DVI responders,” he explains.

He would like to establish a Canada-wide forensic odontology response team, which would be known as CAN-FORT and would provide an opportunity for more specialized training. However, Dr. Sweet stresses that there are currently more dentists excited about forensic dentistry in Canada than are actually needed to respond to cases.

Global Influence

Trying to ease the suffering of a victim’s family is all the motivation Dr. Sweet requires when faced with his daunting caseload. “These waiting family members are the secondary victims of the crime or natural disaster that has occurred,” he says. “I try to use truthful and objective analysis methods to provide police investigators with answers that can move a case forward. Anything that I can do in my power to help give a victim’s name and identity back to them, after circumstances have intervened to steal it away, compels me to remain focused through the difficult times,” reveals Dr. Sweet

In 2006, Dr. Sweet was the first Canadian elected to the position of chief scientist for Interpol’s DVI division. Yet true to his humble nature, Dr. Sweet deflects praise for achieving such an influential position. “I was fortunate to be born with a natural ability to see patterns, which is the basis of forensic dental practice,” he concludes. “I have tried to develop this skill to a point where it can be beneficial to the system of justice. To be recognized for my work makes me quite proud, but at the same time I know that there is so much more that can be done.” ✦

For more information on the Bureau of Legal Dentistry, please visit www.boldlab.org