Other Headlines

NHLBI Funds Research and Training Centers Aimed at Prevention and Treatment of Chronic Diseases
Project in developing countries a collaboration with UnitedHealth Group's chronic disease initiative.

Brain Cancer Treatment: Chemo and Heat Via 3-D Ultrasound Catheter
Duke University engineers have taken a first step toward a minimally invasive treatment of brain tumors by combining chemotherapy with heat administered from the end of a 3-D catheter.

New Jersey University Hospital to Pay Additional $2 Million to Resolve Fraud Claims That Facility Double Billed Medicaid
UMDNJ resolves federal civil fraud allegations.

FDA Clears Hologic R2 DigitalNow HD

The Science of Forensics - Providing Answers to Mysteries

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by Astrid Fiano, Writer

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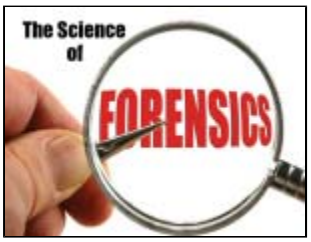

The Science of Forensics

Forensics is a demanding discipline that requires a broad knowledge base and creative approaches to aid in criminal investigations. The field offers a wide array of concentrations, encompassing many different fields of science, including anthropology, biology, chemistry, engineering, genetics, medicine, pathology, phonetics, psychiatry, computer technology and toxicology. The role of the forensic scientist is to ensure that accepted scientific principles are used to examine evidence and to obtain and interpret data by performing precise laboratory work, maintaining and writing detailed findings and explaining and defending these findings in a courtroom.

There are many tools at the disposal of forensic specialists, but radiology is often one of the most useful. Radiology has helped forensics researchers reveal clues that would have otherwise gone unnoticed. Challenging cases and enduring mysteries have been solved and nearly countless detective shows have hinged surprise endings on discoveries the process brings to light. The contraband revealed by X-ray being smuggled by a human container - the damage uncovered in the seemingly trauma-free body of a deceased individual- the list goes on and includes identification of the dead, gunshot wounds, anthropological parameters, forensic dentistry, bite mark analysis, larceny, art forgery, child, spousal, elderly abuse and human rights abuse, torture and terrorism. In fact, although there are artistic liberties taken, entertainment vehicles portray the forensic field in a generally accurate way. Its mission is to prove the existence of a crime or connect certain evidence to a crime by analyzing evidence, providing information to investigators, attorneys, judges and juries - crucial in determining whether someone is guilty of a crime. The reliability of a forensic scientist is vital because findings and decisions hold people's lives and freedom in

Software Application
Software processes digitized prior film mammograms to produce DICOM images that more closely resemble digital mammograms.

AMA Inaugurates J. James Rohack as President
Health reform must deliver "evolutionary change" says new leader of American medicine.

the balance.

Medical Imaging & DNA Testing

Dr. Gil Brogdon, University Distinguished Professor Emeritus of Radiology at the University of Southern Alabama, is one of the foremost experts in forensic radiology. He is the author of "Forensic Radiology," as well as more than 330 scientific publications.

Heather Miller Coyle, Ph.D., Assistant Professor of Forensic Science, Henry C. Lee College of Criminal Justice & Forensic Sciences, University of New Haven

Dr. Brogdon believes that radiographers and radiologists are important members of a forensic team, contributing to the pathologists, anthropologists and those in the field like the police and detectives. With recent natural disasters like Hurricanes Katrina and Rita, as well as manmade tragedies like terrorist attacks and genocides - the contributions of radiologists and radiographers are more important than ever - giving insight into what cannot otherwise be easily examined. "I've been involved in identifying both child and adult abuse cases, police brutality cases, evaluating gunshot and stabbing wounds and physician and hospital malpractice cases," says Brogdon. "It certainly has been a very interesting career for me with many opportunities." He said that one of his most memorable cases involved a victim shot four times by three different individuals who each had a different weapon. "This man lived," Brogdon says. "I was brought in to determine by X-ray the sequence of firing, which gunman fired each shot and the direction of each bullet."

Another expert in the field, Emily Faircloth, Communications Officer for the Association of Forensic Radiographers based in the United Kingdom says there are three key methods for identification of the deceased; dental examinations, DNA and fingerprints. "In the event that DNA sampling and fingerprinting is problematic, as in the Asian Tsunami," says Faircloth, "dental examination is very important." She explained that dental radiography is very common in developed countries and most individuals have had a dental X-ray in their lifetime. "There are up to 32 teeth in the adult dentition, each tooth having five surfaces resulting in over five million variable combinations, hence the term 'dental fingerprint'," says Faircloth. "Post mortem identification using teeth is around 94% accurate."

As a qualified radiographer with over ten year's experience, Faircloth is a founding member of AFR. She reflects on experiences in practical forensic

imaging from attending various deployments such as the International Criminal Tribunal for the Former Yugoslavia in Bosnia. "It involved imaging skeletal remains that were excavated from their mass graves in the hundreds and brought to a mortuary in Visiko," recalls Faircloth. She said that the primary objective was to identify as many individuals and to find out the circumstances of their death, providing evidence for the tribunal in The Hague. "Pertinent points during this - my first active deployment - was the demonstration under X-ray, indicative signs of torture and execution style deaths of not only men but women and children as well. This came as a sharp shock to my system, and I was so glad to have a strong and effective support network that worked closely together - never leaving anyone to feel isolated," says Faircloth.

Imaging Through Virtual Autopsy

For the past few years, virtual autopsies have been changing the way modern medicine studies the dead. By adapting the twin medical-imaging technologies of CT and MRI scans, a three-dimensional, high-resolution computer image of a corpse's internal organs can be viewed from any depth and any angle.

"The virtual autopsy is the one of the most extraordinary developments in the field of forensics since 1946, when child abuse could be determined using X-rays," says Dr. Brogdon. He also explains that virtual autopsies are a way to work around cultural taboos that may not approve of traditional autopsies.

Still, virtual autopsies are now used in many cases as a precursor to a real one. The Pentagon uses virtual autopsies to determine whether or not helmets and body armor are effective protection on soldiers who were killed during battles in Iraq and Afghanistan. Swedish and Swiss researchers are using virtual autopsies on murder victims and there has been a general spark of interest all over the world.

Benefits

RSNA.org says that given that forensic evidence doesn't last forever, virtual autopsy's most obvious benefit is that it creates a digital 3D image - a permanent record that can be studied, archived or sent on to others. This ease of documentation also makes a virtual autopsy particularly well suited for use as courtroom evidence, taking the place of graphic or disturbing photographs. It's a system that not only keeps evidence intact, but also provides a thorough look at areas of the body that may otherwise be difficult to examine.

CT and MRI full-body scans of the dead are non-invasive and can be easily manipulated by cropping, zooming and rotating in any direction. For example, in gunshot victims, bullet paths can be tracked instantly and

in stabbing victims, wounds are clearly visible. Under normal physical autopsy conditions - this information could take hours to obtain.

Any information gathered by a normal autopsy has to be obtained and evaluated immediately because the body does not maintain; whereas a virtual autopsy's scans can be retrieved and used at any time and can be used in a court of law as evidence without the need to show graphic photographs of the victim.

It's even more valuable when working with overly delicate subjects. Not all causes of death can be investigated quickly. Some take years to be handled, some take significantly longer. Using medical imaging, Dr. Ashraf Selim from the Cairo University in Egypt may have solved a case that remained a mystery for centuries.

Ancient Egypt - King Tutankhamun.
It was thought that King Tut might have been murdered (bludgeoned to death) because of two men - Aye who succeeded Tut as King and General Horemhab who in turn succeeded Aye to the throne. Although the mummy of King Tut was in horrific condition at the time of discovery, Dr. Selim was able to determine by medical imaging that smaller leg fractures had accompanied open wounds that became infected and were likely the cause of King Tut's untimely death.

Dr. Selim and Dr. Yehia Zakaria of the National Research Center have also carried out CT scans on two fetuses that were found in 1922 in the tomb of King Tutankhamun. They are believed to be King Tut's stillborn children. Along with the CT scans, Drs. Selim and Zakaria also took DNA samples in hopes of determining the fetuses' mother as well as Tutankhamun's family lineage.

DNA Revolution
The fact that DNA molecules have links to the past, present and future can be life changing. DNA identification is effective when used to identify suspects and victims in criminal investigations, exonerating persons wrongly accused of crimes, identifying catastrophe victims, establishing paternity and other family relationships, identifying endangered and protected species as an aid to wildlife officials, detecting bacteria and other organisms that may pollute air, water, soil and food and matching organ donors in transplant programs.

DNA testing is a powerful tool in criminal cases because it can establish a chain of events leading to a crime or accident and can aid the ability of the prosecution to prove a trial case. Because of the DNA revolution, innocent men sitting on death row are now exonerated. As part of the criminal justice procedure and admissible into a court of law, development of DNA testing now includes semen, blood, saliva, teeth and

bones. Researchers are also continuing to explore DNA and its relation in hair, skin cells and fingerprints. Because of DNA, evidence recovered from crime scenes can be of value even when traditional forms of testing prove negative.

New Technology

Whenever identification is a problem during a forensic archaeology investigation on a body, DNA testing will be used in hopes of finding a solution. Obtaining DNA is never a simple process and is sometimes impossible with bones and tissue that have been long buried.

DNA analysis of bones found in the Gobi desert is proving to be fascinating and has led to a breakthrough DNA technique. Heather Miller Coyle, Ph.D., Assistant Professor of Forensic Science, Henry C. Lee College of Criminal Justice & Forensic Sciences, University of New Haven, and four forensic science graduate students have developed a method for preparing skeletal remains for DNA extraction. They were able to extract DNA from mummy bones (approximately 800 years old) found in the Gobi Desert, and were just as successful upon trying the same on a case Dr. Coyle was working on in the United States.

Coyle and her team determined that the Gobi desert created a natural bone baking process - making the bones more brittle and easier to grind and break open to expose more cells - accessing more DNA. Dr. Coyle copied conditions in the Gobi desert and baked the cold case bones for a few days. Liquid nitrogen was then poured into a pulverizer with the bones and crushed, turning the bone to powder -- ready for DNA extraction. These findings may have implications for scientists around the globe. In the United States alone, the remains of 40,000 missing persons are stored in various medical examiners' offices. "If we can extract DNA through a new process, the possibilities could be tremendous. It raises the question of how far back in time we can stretch criminal justice," says Dr. Coyle.

The Future of Forensic Science

Dr. Brogdon believes that the spectrum of what can be done in forensic science is very broad and largely, "not very well appreciated." He feels that funding in the United States by the federal government is part of the problem - there is very little. "Funding is provided on the county level, maybe at the state level, and sometimes on a federal level, but it is not a priority so funding is a big problem," says Dr. Brogdon. "Education and understanding the value of a radiographer is also a big problem." When it comes to cost, Brogdon suggests exploring the option of purchasing a refurbished piece of equipment which could lead to saving as much as 50% over the cost of a new machine.

The Consortium of Forensic Science Organization (CFSO) released a

statement over a year ago applauding the creation of a National Academy of Sciences committee to study the current state of forensic science in the United States. The CFSO also believes there is a severe lack of funding in the forensic field. A recent crime lab workload survey revealed forensic evidence backlogs exist in all areas of forensics including firearms, trace evidence, DNA, toxicology and pattern analysis like fingerprinting.

One of the biggest challenges facing crime labs and medical examiners offices is keeping facilities up-to-date with equipment and enough staff while working with limited funding. The development of forensic science and funding seems to be highlighted in the President's DNA funding initiative in his 2006 budget. This initiative provides funding, training and assistance to ensure that forensic DNA reaches its full potential to solve crimes, protect the innocent and identify missing persons. Congress modified the budget to provide funding for other forensic disciplines including $108.5 million designated for DNA testing and $18.5 million in grants for the Paul Coverdell National Forensic Science Act. DNA testing is only a small portion of the work done in crime labs, and grants from the Coverdell funding provide crime labs and medical examiner's offices the ability to spend money where each lab has the largest backlog or case log. The CFSO also maintained that forensic providers should determine their own needs, and put federal money to work where it needs the most support. The bill included $1.5 million for the National Academy of Sciences to conduct this study.

Funding is made available periodically through solicitations from the Initiative's Partners and announced online at www.dna.gov/funding.com