

International
Association
of Forensic
Sciences



18th Triennial Meeting
New Orleans, Louisiana, USA
July 21-25, 2008

Book of Abstracts



International Association of Forensic Sciences
18th Triennial Meeting

BOOK OF ABSTRACTS

The *Book of Abstracts* of the International Association of Forensic Sciences (IAFS) is devoted to the publication of the abstracts of technical oral papers and posters presented at the IAFS triennial meeting. These include various branches of the forensic sciences such as computer forensics, criminalistics, engineering, pathology, physical anthropology, psychiatry, odontology, toxicology, questioned documents. Similar submissions dealing with forensic oriented aspects of the social sciences are also included.

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Breakfast Seminars

B1 Bad Science: The Floyd Landis Case

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Floyd Landis, a professional bicycle racer from Murrieta, California, won the 2006 Tour de France. However, not many days after the race's conclusion, the Laboratoire National de Dépistage du Dopage (LNDD) "announced" (actually the information was leaked to the press) that a urine sample obtained from Floyd after stage 17 had been found to be positive for a form of synthetic testosterone. If this finding were to be upheld, Landis would be stripped of his title and also banned from participation in the sport.

Landis denied any sports doping and his strategy in fighting these charges has been to try to generate public support and to make all of the documentation of the LNDD tests available to the public. GC/MS is used by LNDD for preliminary sample screening, and carbon stable isotope ratio mass spectrometry is used for final confirmation.

From the standpoint of a forensic analytical chemist with experience in forensic laboratory accreditation standards, this presentation will examine the analytical data and correspondence from the Landis case in terms of chain of custody requirements, World Anti-Doping Association (WADA) guidelines and LNDD SOP, and reasonable standards of good laboratory practice.

Sports Doping, Floyd Landis, IRMS

B2 Forensically Approved STRs Reveal Genetic Diversity and Differentiation in the Northwest China Populations

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Northwest China is a region where many different independent populations have lived for more than two hundred years. Nevertheless, it's highly worthy to investigate the genetic information of these populations with molecular genetics approaches in order to preserve the genetic resource and polymorphism within this region.

To characterize the genetic differentiation and evolution of 16 different populations and 12 independent minorities, nine autosomal STRs, which are widely applied in forensic science, were selected; then several statistical methods, such as principal component analysis, phylogenetic trees, R matrix analysis, and Mantel tests were processed in parallel with allele and genotype frequency data.

The results of principal component analysis showed that five minority populations living in Xinjiang were clearly separated from other populations. Topologically, the branch of phylogenetic trees was in coordinate with linguistic affiliation. Regression plot of R matrix model suggested most populations had the similar patterns of gene flow at an average level, with the exception of Hui in Qinghai, which received more gene flow from outside. Unexpectedly, results of Mantel test showed that the correlation between genetic distance and linguistic distance ($r=0.5040$, $p=0.0054$) was more dominant than genetic distance and geographic distance ($r=0.0022$, $p=0.4950$), which represents that linguistic difference contributed more to genetic differentiation than geographical isolation.

STR, Genetic Differentiation, Northwest China

B3 New Inspection of Additional Printed Forge Documents

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This seminar presents a supplementary study of additional printed forged documents and introduces a new means of inspection to replace the old examination method. The workshop will demonstrate the common characteristics errors caused by a puncher's mechanism.

The corroborant conclusion is that common characteristics can imprint impersonally on the added printed document.

Lastly a new inspection method based on software from Adobe® Photoshop® will be demonstrated and prove the new inspection methods are more convenient, accurate, and efficient.

Added Printed Documents, Commonness Characteristics, New Inspection

B4 Medicine, Murder, and Mayhem in Ancient Greece

Richard C. Froede, MD, 3930 North Placita de la Escarpa, Tucson, AZ 85750; Richard D. Walter, MA*, 231 South 13th Street, #2, Philadelphia, PA 19107; and Richard D. Walter, 231 South 13th Street, #2, Philadelphia, PA, 19107*

During the time of Hippocrates, 460-380 BCE, the Mediterranean area sounds like an ideal Place to live. Comparing that time to the present is like "Déjà Vu all over again" (Y. Berra).

The presenters will discuss certain aspects of history, medicine, and crime to show that things never change but will repeat endlessly throughout the history of mankind.

They will discuss that today's problems are similar to those that existed centuries ago modified only by today's technology and principles.

Murder, Medicine, Greece

***Presenting Author**

W1 Microfluidics: Advancing Forensic DNA Analysis

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The development of bioanalytical microdevices for genetic analysis has reached a point where the “lab-on-a-chip” (LOC) or micro-total analysis system (mTAS) concept set forth almost 20 years ago is now rapidly becoming a reality. This microfluidic technology stands to revolutionize the way forensic DNA analysis is accomplished, incorporating sample preparation steps such as cell sorting, DNA purification, and PCR amplification, with microchip electrophoresis in multi-purpose, multi-functional devices capable of total, rapid, and automated genotyping.

A fully-integrated, microchip capable of performing the steps normally carried out at the bench would not only reduce the time required to perform these tasks, but would also eliminate user intervention and potential sources of contamination, preserving more of the sample for future analysis. Optimization of these devices for forensic analyses, however, presents a distinctive set of challenges.

Due to the multi-step nature of the forensic DNA analysis process, careful consideration must be given to solution compatibility, sample size, and fluidic interfacing in order to seamlessly integrate these technologies. As the field stands on the cusp of the commercialization of microfluidic systems, the forensic community is provided with the unique opportunity to drive the final design of what promises to be a revolutionary change to the way these analyses are carried out.

This workshop will provide the attendee with a comprehensive overview of the current state of development of microfluidics for forensic DNA analysis, a foundation for understanding the principles of microfluidics and how current DNA processing methodologies are being translated to the microscale.

Additionally, the role of microfluidic systems and practical considerations for their application in forensics labs and in portable genetic analysis systems will be discussed. The attendee will also gain an appreciation of this new technology, its limitations, and the unlimited potential of its application and use in the forensic laboratory. Finally, a view of the future of advanced microscale analytical systems their potential design and use will be presented.

DNA, Microfluidics, Microchip

W2 Introduction to AFIS Systems

Keith B. Morris, PhD, Forensic & Investigative Science, West Virginia University, PO Box 6121, Morgantown, WV 26506-6121*

This workshop will demonstrate the applicability of Automated Fingerprint Systems (AFIS) in a small agency. Attendees will gain hands-on experience in the utilization of a system which will include the entry of both ten-prints and latents. The searching against the AFIS database and the evaluation of results will also be introduced.

The target audience is for all levels who are contemplating the introduction of small AFIS systems or those who would like to hone their skills on AFIS Systems.

Techniques for the improvement of searching criteria and evaluation of the system stability will also be introduced.

Interested persons may bring electronic versions of their ten-prints and latents for testing purposes.

Fingerprint, AFIS, Print Identification

W3 ISO Without Tears

Patricia C. Wojtowicz, BA, MSFS, Forensic Quality Services, Inc., 13575 58th Street North, Suite 153, Clearwater, FL 33760*

Many forensic science laboratory managers are working to prepare for future accreditation to the ISO/IEC 17025 standards. In many cases their agencies have been audited or accredited with respect to other standards and criteria, but ISO 17025 seems to have special significance—and the phrase “ISO Accreditation” often provokes anxiety among even the most “audit-hardened” scientists and managers. One way to lessen anxiety and uncertainty is with knowledge and understanding. This presentation will provide that basic knowledge and understanding about “ISO accreditation” through a discussion of ISO/IEC 17025 accreditation processes and standards. The ISO hierarchy of standards and their place within forensic testing accreditation programs will be described. Guidance will be provided on key words and phrases in ISO 17025 that will assist workshop participants to understand what is required of them in order to be in conformance with the standards. Particular emphasis will be placed upon the ISO 17025 “hot spots”—those “gaps” between ISO 17025 standards and non-ISO 17025 audit or accreditation program standards that can create problems for the unaware. Suggestions for transitioning to an ISO 17025-conformant management system will also be discussed.

A native of Minnesota, Patricia Wojtowicz joined the FQS-International business unit of Forensic Quality Services, Inc. in Largo, FL, in November 2005 as its Manager of Accreditations. FQS-I offers an ISO 17025 accreditation program for public and private sector agencies involved in forensic testing that is recognized by the National Cooperation for Laboratory Accreditation (NACLA). She has a BA (Chemistry) from Augsburg College, Minneapolis, and an MSFS (Forensic Chemistry) from The George Washington University, Washington,

D.C. She spent 26+ years as a forensic scientist for the Virginia Bureau of Forensic Science and the Minnesota BCA Forensic Science Service in St. Paul, MN. She has been a drug chemist; trace evidence analyst; crime scene processor; DNA analyst, technical leader, and section supervisor; laboratory system Quality Manager; and accreditation inspector and DNA auditor. She is a charter member of the Association of Forensic Quality Assurance Managers (AFQAM) and a Past-President of the Midwestern Association of Forensic Scientists (MAFS).

Accreditation, ISO 17025, Standards

W4 UV-Visible-NIR, IR, and Raman Microspectroscopy for Forensic Science

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Most forensic laboratories use an FT-IR microscope for the analysis of trace evidence. In addition, many forensic labs also have (or are budgeting for) a UV-visible-NIR microspectrophotometer and a Raman microspectrometer for the analysis of fibers and paints. There are, however, many more applications for molecular microspectroscopy in the forensic sciences. These include inks, paper, soils, glass, and drugs of abuse.

This workshop will cover the types of samples that can be analyzed, basic optics and spectroscopic techniques, sample preparation techniques for each of the methods, advanced instrument usage techniques, and advanced data analysis techniques. While this class is designed for the forensic practitioner, others interested in molecular microspectroscopy will find the material of benefit as well.

Microspectroscopy, Trace Evidence, Questioned Documents

W5 New Directions in Forensic Taphonomy - Life After Death

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After attending this workshop, attendees will have a better understanding of new developments in forensic taphonomy, specifically early postmortem decomposition, microbially-mediated processes, and the influence of environmental parameters. Furthermore, understanding the influence of taphonomy on the quality of biomolecules, and interpretation of taphonomic signals in osseous material can help improve future sample selection. Strategies for dealing with taphonomically compromised samples will be discussed.

This workshop will impact the forensic community and/or humanity by informing attendees on the wide-ranging possibilities of new taphonomic research in the forensic setting, including the relationships between decomposition, soils, and soil microorganisms.

Forensic taphonomy has been established as a valuable tool in forensic research. Recent studies both in forensic and archaeological taphonomy aim to expand the current knowledge to reveal perimortem history, offer new tools for estimating the post mortem interval and improve sample selection for and recovery of biomolecular information (e.g. DNA).

Decomposition is a vital, yet often overlooked, process for life on Earth. This process contributes to the cycling of carbon and nutrients in all terrestrial ecosystems and is primarily biologically mediated. Several recent studies have shown that the behavior and development of some of the organisms involved in decomposition can contribute to the estimation of post mortem interval, location of clandestine graves, and determination of cause of death. The main factors that regulate decomposition and how they relate to forensic taphonomy will be discussed.

After death, bones and teeth are most resistant to decay and usually survive longest. Studies in archaeological bone decay have shown that biological alteration of the bone structure can already occur within years postmortem, which makes it an interesting subject for forensic taphonomy. Of course, environmental and edaphic parameters influence the (biological) degradation of bone as well, such as rapidly fluctuating water levels and acid soils in a burial site, as will be shown in several case studies and experimental field burials in terrestrial and marine environments.

Enclosed and relatively protected within mineralized tissues are biomolecules, like DNA and proteins. Obviously, the processes that alter bone also influence the preservation and quality of these biomolecules. Biomolecular archaeologists have made progress in their attempts to understand the limits to survival of DNA, lipids and proteins in a variety of different settings and have developed tools to use this information to assess age at death (from the states of protein decay) and predict the likelihood of DNA amplification success. The

usefulness of this knowledge for the forensic community will be discussed. Understanding the way in which collagen - the most important protein in bone - breaks down can help to predict the fate of bones in different burial environments. Using TEM, DSC, and amino acid analysis, decomposition of collagen is described, as well as how different burial environments will affect the rate of this process. Forensic research will benefit from what biomolecular archaeologists have learnt about the taphonomy of nucleic acids, lipids, and proteins and the role played by their local and wider survival.

DNA preservation will also be discussed in detail. It can vary as a function of the taphonomical context, but the anatomical location it is extracted from also plays a role. Post recovery DNA degradation is an important factor that must be taken into account, especially in samples that have been stored for a while. However, DNA may well be preserved in molecular niches in degraded samples, where traditional analytical methods fail to recover it. Several approaches, such as high throughput sequencing methods, are described, which enhance reliability and recovery of DNA from degraded forensic or ancient samples, allowing the yield of maximal information of degraded tissue.

Humans are important taphonomic agents, for example through embalming. The goal of embalming is to retard the processes associated with decomposition. Pre-burial treatments, such as synthetic cross-linking and heat treatment, will dramatically alter bone collagen and in doing so not only change the diagenetic trajectory of bone but also influence chances of DNA recovery. A case study, where 865 soldiers from the Korean War were embalmed in the 1950's will be discussed, describing the current state of the remains and the consequences for their identification.

Arguably, the traditional view of decomposition is that it results in the loss of information on different levels, ranging from macroscopic to molecular. However, we argue that taphonomy also adds valuable information. Deciphering early postmortem history and time since death from these indicators is a valuable approach in forensic research. Moreover increased knowledge of taphonomy in forensic studies can inform about the quality of DNA results, aid in sample selection and improve recovery of biomolecular information.

Taphonomy, Bone, DNA

W6 Ethics in the Forensic Sciences - When is the Line Crossed?

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"Tainted Science and Testimony Leads to Re-opening of 120 Cases over Last 15 years;" "Man Freed after Serving 21 years in Prison due to Lab 'Oversight?';" "State Crime Lab Employee Accused of Biased Analyses and Testimony" – all headlines that can confront, and scare, legitimately practicing forensic scientists. At the heart of this fear is wondering how such events occur since inherent in the practice of forensic science is the requirement for each practitioner to be ethical.

The word "ethical" can be defined merely as proper conduct. Tacitly, a failure of forensic scientists to act ethically results in serious adverse outcomes. However, while seemingly simple to define, the application of being "ethical" is somewhat more obscure. That is, when is ethical, ethical, and when is it not?

Clearly, as part of an adversarial legal system, there must be room for differences of opinion in the forensic sciences. What is not clear, however, is when such differences are so divergent that individuals' ethics are drawn into question. In this workshop, a diverse pool of expertise has been compiled to address the role of ethics in the forensic sciences from several different perspectives with the intent of approaching an understanding when the proverbial ethical line is crossed.

The workshop will begin with a brief introduction to ethics, the role ethics plays in society and potential outcomes of unethical behavior, especially in the forensic sciences. Results of a survey on ethics in forensic science will be discussed. Presentations will further involve comparisons to canons of ethics in the related fields of medicine and law, the expectations, and limitations of being a government scientist, and lastly, the status of ethics in forensic science education.

As we move forward into the age of globalization, the forensic sciences worldwide will be under ever-increasing scrutiny. In that respect, with the dissemination of information associated with the forensic sciences through such outlets as the internet, television and the print media, expectations and associated ethical issues will surface perhaps more than ever before. By meeting the issues of ethics in the forensic sciences head-on, we can hopefully be prepared for these challenges.

Ethics, Education, Forensic Science

W7 AgEstimation Project

Roberto Cameriere, PhD, Danilo De Angelis, MD*, and Francesco Scarpino, MD, Institute of Legal Medicine, University of Macerata, Via Don Minzono, Macerata, 62010, Italy*

Age estimation is an important problem both in living and dead, young and adult, subjects. In the last years Cameriere and all have published several papers about age estimation methods. This workshop is an aid in the knowledge and understanding of the techniques used with an easy and fast visualization of all the necessary points for their application.

Adobe® Photoshop® is used for this method to determinate the area of the pulp chamber of a canine and its entire area. This two variable, together with the sex variable, are inserted in the regression formulae to evaluate chronological age of a living or dead adult subject.

Age Estimation, Forensic Anthropology, Illegal Immigration

W8 Mass Fatality Response Preparation Workshop

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A mass fatality is situation where there are multiple deaths exceeding the routine capability of local resources. The mass fatality will vary in size based on the capacity of the local resources. If requested, the Federal Government may provide limited assistance but the local jurisdiction(s) is/are still in charge and must manage the incident. History has shown that families want answers immediately. Does your jurisdiction have a comprehensive and effective Mass Fatality Response Plan?

A team of experienced professionals will assist you in understanding the need for mass fatality planning. Topics will include body recovery, morgue operations, Victim Identification Program (VIP) software and integration, family assistance center operations, DNA collection, testing and identification operations and funding challenges.

Introductory presentations will be followed by a brief tabletop exercise which will effectively raise the level of awareness as to the actual state of readiness within the participant's organization/jurisdiction.

Mass Fatality, Response Preparation, Disaster Victim Identification

W9 Forensic Investigation of Fire Deaths- Accidental and Homicide

Elayne J. Pope, PhD, University of Arkansas, 330 Old Main, Fayetteville, AR 72701*

This presentation will illustrate how the human body burns for arson and death investigators. The lecture will cover topics of accidental fires and normal burn patterns as it applies to forensic casework, and features of homicide, particularly identification of traumatic injury (ballistic, blunt force, and sharp force trauma) for differentiating manner of death between accidental or criminal attempts to destroy evidence of the body with fire.

Dr. Pope has lectured to state chapters of the International Association of Arson Investigators for New York, Florida, Arizona, Oregon, Connecticut, South Carolina, North Carolina, Indiana, Colorado, and Arkansas. She has taught Forensic Anthropology, Criminalistics, and Forensic Taphonomy at the University of Arkansas in the Anthropology Department, Northwest Arkansas Community College, and consults on forensic cases involving skeletal or burned human remains for the Arkansas State Medical Examiner's Office.

Fire Death Investigation, Trauma, Cremation

W10 The Applications of Raman Spectroscopy in Forensic Science

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Raman spectroscopy has recently become more popular for the chemical analysis of several types of materials of forensic interest. The Raman technique allows for the measurement of the inelastic scattering of light due to the vibrational modes of a molecule when irradiated by an intense monochromatic source such as a laser. Thanks to important technological progress, modern Raman spectrometers have increased their sensitivity necessary to detect the weak signal called Raman scattering.

The workshop on the application of Raman spectroscopy is aimed to familiarize interested forensic scientists with this technique. The advantages and limitations of the Raman technique will be emphasized. Amongst the advantages, figures its non-destructive nature, short analysis time, and the possibility of performing microscopic in situ analyses.

Several distinguished guests will be present to share their experience and expertise in different area of forensic sciences. The first part of the workshop will present some theory on Raman spectroscopy and highlight the application of this technique on different types of forensic samples. A state-of-the-art concerning the use of Raman spectroscopy will be presented on drugs of abuse, questioned documents and ink analysis, explosives and trace evidence.

Practical training is also provided and will allow the participants to become familiar with the latest versions of commercially available instruments, their components, their functions, and their manipulations. Several instruments of different manufacturers will be presented. The second part of the workshop will allow the participants to do some practical work on Raman instruments. The advantages and disadvantages of the analysis for several types of materials and the problems linked to the interpretation of results will be shown and discussed.

Raman, Spectroscopy, Trace Evidence

W11 Forensic Laboratory Planning and Design

*Michael G. Mount, BA**, SmithGroup, Incorporated, 455 North Third Street, Suite 250, Phoenix, AZ 85004

This eight hour workshop was first presented in 2003 to the European Academy of Forensic Sciences in Istanbul. The first half of the workshop covers the entire project development process for a forensic laboratory from establishing the need, design programming, and the facility design process. Critical design issues are addressed, including mechanical, electrical, plumbing, security, safety, and site requirements.

The second half of the workshop addresses the specific architectural and engineering design requirements for each of the major laboratory sections within the forensic laboratory. The presenter has been designing forensic facilities throughout the United States and abroad since 1983.

Design, Planning, Building

W12 Investigations of Disputed Signatures: Motor Control Perspectives

*Bryan J. Found, PhD**, Victoria Police Forensic Centre, 31 Forensic Drive, Macleod, Victoria 3085, Australia; and *Linton A. Mohammed, MFS**, San Diego Sheriff's Regional Crime Laboratory, 5255 Mt. Etna Drive, San Diego, CA 92117

Opinions by forensic specialists regarding the authenticity of disputed signatures are underpinned by both theoretical and experiential components. Traditional theory has, in recent times, evolved to incorporate aspects of the process by which complex movements are learned and carried out in the environment. Much of the theory required by forensic handwriting examiners can be extracted from the motor control literature. This eight-hour workshop will provide participants with psycho-physiological theory directly related to the normal process of production of skilled signatures and will explore why it is, at a sensory/motor level, that skilled signatures are difficult for individuals to mimic successfully.

The morning session will explore the theoretical relationship between the work of specialists on genuine, disguised, and simulated signatures and the production of these forms in both the static and dynamic domains. The afternoon session will be focused on real examples of these signatures; will provide participants with the opportunity to consider motor models of their production, in terms of features that they can observe, and will provide further insights into the interpretation of static features in the dynamic domain.

Participants should gain a clear understanding of the relevance of motor control science to the forensic signature examination paradigm. They will be provided with opportunities to examine genuine, disguised, and simulated signatures and carry out blind tests to assist in their personal skill assessment with respect to relating theoretical constructs to casework problems.

Document Examination, Signatures, Motor Control

W13 The Use of LC/MS in the Forensic Toxicology Laboratory

Christopher Heartsill, BS, Dallas County Medical Examiner, 5230 Medical Center Drive, Dallas, TX 75235; Susan R. Howe, PhD, Tarrant County Medical Examiner, 200 Feliks Gwozdz Place, Fort Worth, TX 76104; Tania A. Sasaki, PhD, Applied Biosystems, 850 Lincoln Center Drive, Foster City, CA 94404; H. Chip Walls, BS, University of Miami, Department of Pathology, Forensic Toxicology Laboratory, 12500 SW 152nd Street, Building B, Miami, FL 33177; Robert D. Johnson, PhD, Federal Aviation Administration, Civil Aerospace Medical Institute, Oklahoma City, OK 73125; and Francois A. Espourteille, PhD, Thermo Fisher Scientific, 101 Constitution Boulevard, Franklin, MA 02038*

Gas chromatography/mass spectrometry has long been recognized as the gold standard for drug identification in a forensic toxicology setting. Recent years, however, have seen the development of liquid chromatography/mass spectrometry (LC/MS) as a powerful new tool for both identification and quantitation of a variety of compounds. With the advent of this increasingly affordable technology, many laboratories have turned to LC/MS as an integral part of their operation.

This workshop will provide the participant with an overview of LC/MS operation, and discuss the advantages of moving from GC/MS to LC/MS/MS. It will include an overview of LC/QqQ (triple quad), LC/QTOF (time of flight), LC/TOF, LC/MS (single quad), LC/MS ion trap and DART-TOF (Direct Analysis in Real Time, Time of Flight MS) technologies. The different mass spectrometers will be discussed in light of each instrument's strengths and weaknesses for providing forensically acceptable, highly sensitive screening and identification results.

In addition, a strategy for LC/MS method development and validation will be presented. Several LC/MS applications will also be discussed, including screening biological samples for hundreds of drugs of forensic significance, as well as quantitation of several drug classes routinely encountered in the forensic toxicology laboratory. Further discussion will be provided on a software interface for LC/MS that enables users to quickly develop and implement testing methods and to train novice users in LC/MS operation.

Forensic Toxicology, Mass Spectrometry, LC/MS

W14 Building the Case For a New Lab

Gwen K. Chouinard, BA, Crime Lab Design, 1620 Fifth Avenue, Suite 100, San Diego, CA 92101; Ken C. Mohr, BS, and Laurie Sperling, MA*, Crime Lab Design, 14 N. Newstead, St. Louis, MO 63108-2208; Lou Hartman, BSME*, Crime Lab Design, 26913 Northwestern Highway, Southfield, MI 48033; and Jon Kokanovich, BS, MA*, Crime Lab Design, 3515 E. Kristal Way, Phoenix, AZ 85050*

Who Should Attend? The targeted audience is crime lab directors and/or user representative "champions" involved in the early stages of planning new or renovated laboratories. To ensure interactive participation, we suggest up to 25 workshop attendees.

Crime Lab Design professionals demonstrate a practical approach to help crime lab directors build the case for a new or renovated lab. By attending this workshop, they will: gain a basic understanding of current issues and trends in forensic science; learn how to assess the effectiveness of their existing labs; and, develop planning strategies and methodologies for building support and obtaining financial resources for a new or renovated forensic facility and improving processes.

Many laboratories across the country are under funded, are located in inadequate facilities, don't have the latest computer and equipment, and have ever-increasing demands for their services. This workshop provides attendees with the tools and methodologies to help them quantify, justify, and build support for capital investment in their forensic facilities.

The course content includes a combination of electronic presentations plus other collateral material, together with open discussion and group planning exercises. These illustrate issues and trends in the design of forensic facilities, assessing existing facilities and processes, determining whether to renovate or build new, planning methodologies for sizing, scheduling and costing a project.

Each participant receives bound course materials that include copies of the presentation and other useful support materials such as sample needs assessment questionnaire, situational matrix, process mapping flow diagram, budget spreadsheet, milestone schedule, equipment matrix, chemical inventory, reference bibliography, and case study.

The workshop is divided into four sections approximately 45 minutes in duration with 10-minute breaks between sections. There is a fifth section (summary conclusion) lasting about 20 minutes. Questions are welcome throughout the presentation.

Each participant is encouraged to bring and share specific metrics about their existing lab, operations, staffing, and funding. A short questionnaire will be provided online or on-site to gather this information before the workshop.

Within the last 9 years, Crime Lab Design presenters have helped 38 clients in 32 cities across the U.S. with forensic planning and design services. Crime Lab Design is an alliance between HERA and Harley Ellis Devereaux. They have broad experience working with forensic scientists, administration, municipal, and state officials to program, plan, and design forensic facilities for ASCLD/LAB accreditation. These facilities have included high-sensitivity and mitochondrial DNA labs, in-situ/genetics labs, and toxicology labs for drugs and alcohol, together with firing ranges, vehicle inspection bays and evidence receipt and storage facilities, to name a few.

This half-day workshop has been organized to encourage individual group participation and to provide flexibility for special areas of interest that may result from open discussion. The following is a basic course area, learning format, and estimated durations.

This workshop is designed for forensic professionals who believe that they need a new lab but just don't know where to start. Tools and methodologies will be provided to attendees to help quantify, justify, and build support for capital investment in their forensic facilities. The course content will include issues and trends in the design of forensic facilities; assessing existing facilities and processes; determining whether to renovate or build new; and methodologies for sizing, scheduling, and costing a project. This workshop will be very participatory so attendees should come prepared to roll up their sleeves and try their hands at designing a lab.

Laboratory, Design, Engineering

*Presenting Author

660 Healthcare Issues of Detainees in Police Custody, London, UK

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Introduction: Little is known about the general healthcare needs of detainees in police custody. The aims of this study were to: determine the level of general health issues, diseases and/or pathology for detainees in police custody, and to determine how well those general health issues, diseases and/or pathology are being managed by the detainee.

Methods: This was done by reviewing intended and prescribed medication needs with current medication availability. In August 2007 a prospective detailed, anonymous, structured questionnaire survey was undertaken of 201 detainees in police custody in London, UK. Of these 83.6% consented to participate in the study.

Results: Of the subjects, 85.1% were male; mean age was 33.9 years; 70.8% had English as a first language; 13.7% were of non fixed abode; 70.2% were registered with a GP; 25% were already in contact with other healthcare teams; 7.1% had previously been sectioned under the Mental Health Act 1983; 16.7 % had previously intentionally self-injured; 33.9% were dependent on heroin, 33.9% on crack cocaine; 25% on alcohol, 16.6% on benzodiazepines and 63.1% on cigarettes. Fifty-six percent of subjects had active medical conditions; of those 74% were prescribed medication for those medical conditions; only 3/70 had their medication available. Of the surveyed, 28/70 were not taking medication regularly, and many were not taking it at all. Three subjects who had DVTs were not taking their prescribed anticoagulants and six subjects with severe mental health issues were not taking their anti-psychotic medication. Mental health issues and depression predominated, but there was a very large range of mixed diseases and pathology. Asthma, epilepsy, diabetes, deep vein thrombosis (DVT), pulmonary embolism, hepatitis, and hypertension were all represented.

Conclusions: The study has achieved its aims and has also shown that, in part because of the chaotic lifestyle of many detainees, appropriate care was not being rendered, thereby, putting both detainee, and potentially others coming into contact with them, at risk.

Police Custody, Detainees, Healthcare

541 Medicolegal Evaluation of Juveniles Directed to Delinquent Behavior in Turkey

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Aggressive behavior, noncompliance, and rule breaking are common at adolescence period which is a transitional period between childhood and adulthood. It can be a very difficult for some individuals. Although greater emphasis has been placed on researching this period the reasons resulting in adolescents becoming delinquent are still not very clear.

Juveniles directed to delinquent behavior emphasize special considerations because of the facts regarding age, psychological conditions, and effects of community before and after the crime. Having a ratio of 5% among all crimes, juvenile delinquency shows many important differences from adult crimes because of the different sets of behavioral patterns in adolescence.

This retrospective study was conducted on juveniles between the age of 11 to 18 with the purpose of revealing differences of medicolegal approaches to juveniles, necessity of interdisciplinary approaches and evaluating characteristics of adolescence such as age, gender, mental status, criminal responsibility and season of the year at the time of the crime, instruments used and kind of crime in which the cases referred to the 4th and 6th Specialization Boards of the Council of Forensic Medicine. In addition to these, victim's age and gender were determined in sexual crime.

Of the 30,411 case reports examined, 1658 were included in this study. Mean age of the juveniles directed to delinquency was 15 and more than 90% of them were male. The most frequent crime was theft, followed by sexual assault and homicide. The results of the medicolegal examination reports demonstrated that 35% of offenders had criminal responsibility.

As a result, awareness of the factors that direct juveniles to delinquent behaviors, overall evaluation of medicolegal and psychiatric examinations and appropriate approaches to juvenile's situation will improve the conditions with which adolescence are faced. The delinquent juveniles' characteristics will be better understood which will reduce and prevent juvenile delinquency and constitute a comprehensive data for staff who will pursue their studies in this field and in Turkish adolescents.

Juvenile Delinquency, Childhood Crime, Forensic

220 The Unified Method for Analysis on Cause of Death and Injury

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Theoretically, the adverse factors that could break the dynamic balance of internal and external environment in vivo can be classified into three degree according to its strength: (a) if the strength is slight, it can make the organ and tissue react adaptively; (b) if the strength is moderate, it exceeds the adaptive competence of the organ, it can cause decomposition, bring changes of the morphous of the tissue, and even disease or injury; (c) if the strength is severe, it could result in the single vital organ damage or multi-organic function failures (MOF) and lead to death. The source of adverse factors, can be divided into the physical factors (mechanical force, electric current, high/low temperature, radioactive ray, etc.), chemical factors (poison, drug, medicine, etc.), biological factors (causative organism, allergy, genetic disorder, etc.), social-psychological factors (heavy pressure from life and job), and so on. According to the social character, the adverse factors also could include the nonviolence (nature) and violence. In summary, these factors and its impaired mechanisms should be consistent or correlative, which cause reversible or irreversible disease or injury and individual death by the single factor or multiple factors. In other words, it is not different factors for invalidity and death but the different strengths and sites of action. Therefore, it can be concluded that the theory of analysis on cause of death will suit analysis for the cause of injury, and the analysis on cause of death and injury should be unified. Synchronously, the unified method of analysis and "degree of contribution" of all factors should be adopted to explain the correlation of multiple factors. This can prevent the analysis of a case in isolation leading to confusion in the chain of causation.

Considering as above reasons, the unified method for analysis on cause of injury or disease and death was established on the basis of the tenth Revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10). The classification of the causality about all factors should include underlying cause, immediate cause, intermediate cause, contributory cause, conductive cause, synergistic cause, conjoined cause, and concurring factor. It is expected that the unified method could benefit the forensic identification, the trial, and compensation.

Table 1. Criteria for determining the contribution of factors

Classification	Description	Degree of contribution (%)
Underlying cause	The causes should be the primary and fundamental factors to occur the injury or disease, or its event, and the main actors should be responsible.	60-100%
Immediate cause	It is considered the final factor or mechanism as a result of all causes of injury or death.	0%
	No previous factors could be found, the cause should be think as an integration of all.	100%
Intermediate cause	There is no direct relation with the result of the incident, but the factor bridge the underlying or immediate causes and the results.	30-40%
Contributory cause	There is no direct relation with the result of the incident, but the factor contributes to the result.	30-40%
Inductive cause	There is no direct relation with the result of the incident, but the factor is the initial cause, and it induces to occurrence of the incident.	10-20%
Synergistic cause	A single factor could not result in the incident, which attribute to the synergistic actions of multiple factors. And the interactions of them amplify the effect of sequelae.	Each factor will share the degree of contribution (100%).
Conjoined cause	When there are two or more factors existed at same time, one of them could result solely in the same sequelae, and is difficulty to distinguish primary and secondary between them.	The degree of contribution of each factor is 100%.
Concurring factor	Other illnesses, trauma or their sequelae and complications should be considered the concurring factor without any causality and contribution to the results.	0%

Note: In one case, the degrees of all factors add up to 100%, and the degree of more than two factors should be dissected according to each contribution.

Analysis of Cause Injury and Death, Causality Classification, Contribution Degree

673 Retrospective Analysis of Body Injuries in the Region of Thessaloniki-Hellas

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The author will present and evaluate the body injuries that were examined at the Departments of Forensic medicine in a one year period (1/1/2005 -31/12/2005) in the region of Thessaloniki – Hellas. Two Hundred Seventy-five cases of body injuries were analyzed: categorized in sex, age, means used, location of the injury and medical aid offered Males [159 cases-58%, 34 years mean age] suffer the highest proportion of body injuries. Females [106 cases, 28 years mean age] suffer 38, 5% of body injuries: a percentage of 5% represents sexual molestation and/or sexual abuse, the Battered Wife Syndrome is present in 11% of the cases (32 years mean age). The Battered Child Syndrome (50%) and Child Sexual Abuse (25%) appear in our study as the most common body injuries of childhood (3, 5%).

Child Sexual Abuse, Battered Child Syndrome, Battered Wife Syndrome

239 Intra and Extra-Familial Sexual Crimes: Consequences Severity

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Diagnosis and intervention in cases of sexual abuse of children and teenagers, both intra- and extra-familial (IF, EF), are complex tasks. These two situations can present specificities implying different strategies in the diagnosis and support to the victims. Some data suggests that intra-familial abuses are more serious in their consequences but these aspects have never been studied in Portugal.

The present study is aimed to contribute to a better characterization of sexual abuse in these contexts by identifying possible differences between these abuses.

A retrospective study was carried out based on reports by sexual abuse experts made in the legal-medical services of the Legal Medicine Institute in Oporto, between 1997 and 2004, relating to victims under 18 year-old (n=764). The forensic psychology reports on the cases in which an expert exam took place (n=29) were also analyzed. For the statistical analysis, the chi-square test, contingency tables and the t student test were used. A significance level of 5% for both types of variables was established.

IF abuse averaged 34.9% (n = 267). Of the victims, 83.6% were female, the average age was 11 years and 77.4% were students. Of the abusers, 99.6% were male (in only one case the abuser was the mother). In the EF abuse cases, in 21% the abusers was a friend or neighbor, in 43.6% a casual acquaintance and in 34.7% of cases the abuser was unknown; in IF abuse, in 43.6% of cases the abuser was the father and in 6.4% the stepfather. Comparison between IF and EF cases showed statistically significant (p<0.001) differences in: age (IF cases are younger); antecedent of abnormal behavior in abuser (IF cases with antecedent sexual abuse is much higher, showing a higher tendency towards continuous or repeated abuse over time); type of abuse (physically more intrusive practices as penetration or an attempt at vaginal and/or anal penetration, were more common in EF cases); physical violence (more common in EF cases); psychological violence by threats (more common in IF cases); number of cases in which the victim gave his/her alleged agreement for these practices (higher in EF abuse); medicolegal examination more than 48 hours after the last instance of abuse (much more common in IF cases); negative forensic results for physical evidences (more in the IF context); evidence of vaginal penetration (more in the EF context). A forensic psychological evaluation of the victim showed that 62.1% were as a result of IF abuse; in 48.3% of cases, the abuse was confirmed by the psychological evaluation; in 58.6% of cases, the victim's testimony was considered to be true (63.6% EF and 55.6% IF - p<0.001).

Results are in line with the majority of the existing data, and demonstrate that the victims of IF abuse are more vulnerable by virtue of their age, emotional ties and their dependence on their abuser as well as the threat levels to which they are subjected. On the other hand, victims of IF abuse are cases which are more hidden and less visible due to the fact that they happen at home and in a more recurrent pattern. The result is that these individuals contact the legal and medical professionals much later than EF victims, making it much more difficult to find physical and biological evidence of the abuse. A further problem is that IF abuse shows less penetration and therefore fewer injuries. This in no way reduces the severity of the situation, for, even when there is less physical penetration, the emotional damage may be much greater. This is why a systematic examination of the forensic psychological examination is fundamental, provided this is done by experienced professionals.

Extra-Familial Sexual Abuse, Intra-Familial Sexual Abuse, Sexual Abuse

93 Rape Epidemic in Mthatha Area of South Africa

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Sexual violence is a well-recognized global health problem, but there has been little research. There were 52 733 reported rapes in South Africa in 2003/2004, almost half of them involving children.

The objective of this presentation is to estimate the incidence of rapes in Mthatha area of South Africa.

This is a retrospective study done at Sinawe Center over a period of 6 years from 2001 to 2007. This unit is a component of the Nelson Mandela Academic Hospital. It caters about a population of about 300 000.

There were 2,378 victims of sexual assault reported at Sinawe center between 2001 & 2006. The rate of sexual assault is increasing from 39 per 100,000 women in 2001 to 416.5 per 100,000 in 2006. The mean rate is 198 per 100,000 women per year (Median 156.2). The association of sexual assault with time is statistically significant ($\chi^2=516$, $df=1$, and $p<0.001$). The highest number 1400 (59%) of sexual assaults was between the age of 11 and 25 years. There is a significant association between age group and year of sexual assault ($\chi^2=6.1$, $df=1$, and $p<0.01$).

There is an increasing trend of rapes in Mthatha area of South Africa.

Rape, Sexual Assault, HIV

694 General Clinical Management of Craniocerebral Traumatized Patients in Road Accidents

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The statistics of European trauma centers show that the average age of victims suffering from polytrauma is 34 years and 80% out of the fatal polytrauma cases are caused by road traffic accidents.

Although there is a wide range of ways in which injuries can be produced in a car accident, some of the most frequent causes of a victim's death are shock (hypovolemic and/or trauma), internal bleeding, and cerebral lesions.

In the clinical and anatomopathological outlook of the skull-cerebral trauma (TCC) there is a difference in approach between the physician and the forensic expert. Establishing a common language and correlations between the clinical observations and the necropsy can lead to an improvement in the quality of medical assistance given to patients suffering from polytrauma and perhaps to an increased number of survivors.

This experience in the forensic medicine practice has a special importance regarding the analysis of the most frequent death causes in car accidents and, implicitly, of the main types of traumatic lesions that lead to death. In China, unlike other EU countries, the necropsy is mandatory in violent death cases and thus, in the case of all victims of fatal car accidents.

The scientific analysis of the correlations between the diagnosis, clinical and paraclinical observations in the survival period right after the car accident on one hand and the necropsy observations during forensic necropsy, on the other hand, is a method to identify the source of errors in polytrauma diagnosis and can help to improve the treatment in the prehospital and intrahospital phase.

In case of deaths from fatal car accidents, the most frequent cause of death seen in victims who survived days or weeks is cerebral trauma and respiratory infections.

The presence of bilateral lesions (placed at the level of both hemispheres) is a normal observation for the forensic expert, but contradicts the vast majority of the classical theories regarding the neurosurgical behavior in the cases of skull-cerebral trauma. This fact is confirmed by the practical necropsy experience and proves the fact that the classical neurosurgical strategies, that had as reference point the neurological center signs occurrence, must be reevaluated and new imagistic and paraclinic diagnosis reference points should be defined in the case of skull-cerebral trauma nowadays, in which, the most lethal TCC are produced in car accidents.

Car Accidents, Bilateral Hemispheres Lesions, Causes of Death

577 Missed Ectopic Pregnancy Leading to Death – A Medico-Legal Perspective

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A 24-yr-old young married female was brought to emergency room unconscious at 8:30 a.m. Blood pressure was not recordable, pulse was feeble and 100bts/min, with pallor. H/o mild cough and fever for 2 days. An episode of vomiting (2times) and loose motion (once) was recorded at 4.30 a.m. of the same day. No signs of any external bleeding were found. No h/o of amenorrhea. She was given differential diagnosis of meningococemia, poisoning, or seizures. The patient expired at 3:00 p.m. on the same day. An autopsy was performed. Ruptured ectopic pregnancy of ampulla of the right fallopian tube was noticed; and free blood with clots of 3500c.c was found in the peritoneal and pelvic cavity. Histopathology of uterus and its conceptus was done and pregnancy was confirmed. Medicolegal aspect this case is discussed and a review of literature is presented.

Ectopic Pregnancy, Death, Medico-Legal Perspective

388 Forensic Clinical Appraisal About Large Vestibular Aqueduct Syndrome (LAVS) of Three Cases

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In 1978, Large Vestibular Aqueduct Syndrome (LVAS) was described because only the large vestibular aqueduct part of this syndrome could be detected by computer tomography scans. LAVS may result in sudden, fluctuating, or progressive sensory neural hearing loss. Some studies have found that between 5% and 7% of people with sensory neural hearing loss of unknown causes really have LVAS. LVAS is a congenital anomaly of the inner ear. People who have LVAS are not born with a hearing loss, but merely are predisposed to the development of a hearing loss.

This paper reports three forensic clinical appraisal cases of LVAS in injury litigation.

Case One involved a six-year-old boy who fell when his father's bike was bumped by a car. Clinical examination showed soft tissue injury.

Case Two involved a four-year-old boy who fell from a trampoline in the kindergarten and hurt his head.

Case Three involved a sixteen-year-old male who was hit on the head by his classmate's hand.

In these cases, all victims claimed that they had suffered hearing loss after the head trauma. Clinical examination corroborated sensory neuronal hearing loss in both ears. Case One was diagnosed with LVAS, Case Two and Three were determined by forensic clinical medical appraiser to have suffered hearing loss as a direct result of head trauma.

In the authors' institute, high-resolution computer tomography scans of the inner ear were performed and it enabled diagnosis of LVAS in these victims. Characteristics of LVAS include:

1. Sudden hearing loss observed frequently among children.
2. The hearing loss is primarily a sensory neural hearing loss.
3. LVAS in both ears (bilateral) is much more common than LVAS in only one ear (unilateral).
4. The fluctuating sensory neural hearing loss.
5. Progressive sensory neural hearing loss.
6. Sudden hearing loss following a minor head injury or other activity associated with increased intra-cranial pressure.
7. The identification of a large vestibular aqueduct on a CT scan or the MRI identification of the large endolymphatic duct and sac.

Litigants frequently provide false history and exaggerate their injuries. Forensic appraisers need to be objective end to find the truth and submit accurate evidence to the judge.

Forensic Clinical Medicine, Large Vestibular Aqueduct Syndrome, Hearing Loss

686 Spectrum of Fatal Common Household Poisoning in North West India: A 30-Year Autopsy Experience

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Objectives: 1. to identify the nature, proportion and changing pattern of fatal compounds available in the North-West Indian households, as observed in a hospital setting; 2. to know the various epidemiological factors effecting the incidence and pattern of common household poisoning; and 3. to suggest preventive measures and to provide baseline data to health policy makers to equip health care institutions accordingly.

Methods: Present study is a retrospective analysis of autopsy records of 11590 medico-legal deaths occurred in Postgraduate Institute of Medical Education and Research, Chandigarh, a Tertiary Care Hospital of North-West India between 1st Jan.1977 to 31st Dec. 2007.

Results: Agrochemicals (62%), pharmaceuticals drugs (6%), alcohol (5%), corrosives (2.6%) were the main fatal household's poisons, constituting 11.3% of the total unnatural deaths. The majorities (77%) of the subjects were between the ages of 16-35 years with male preponderance (69.3%). The incidence in the urban victims increased from 45% in 1977- 1982 to 76% in 1992 to 97 and then decreased to 57% between 2002 to 2007 and among the married, it increased from 22% to 61% during this period. The proportion of suicidal deaths increased from 44% to 62% between 1977 to 2002 with peak of 74% in 1982 to 87 then decreased to 53% in the last five years of study, whereas that of accidental deaths decreased from 56% to 36% and then again increased to 46% during same period. In males, agricultural workers (37.4%) followed by unemployed persons and students (21%) and in females, house maker (36%) followed by students (32%) and unemployed (28%) were the main victims. Organophosphates/carbamate (40%) followed by Barbiturates (37%) were the most common poisons between 1977 to 1982 and since then aluminium phosphide (51.3%), a fumigant grain preservative has been the most common poison. Statistically significant seasonal variation particularly to agrochemicals parallel to the crop cultivation practices was observed

Conclusion:

Besides implementing highly prohibitive public health measures, active involvement of agrochemical related industries in educating people regarding handling and management of any eventuality involving hazardous substances, access to professional expertise for early diagnosis and treatment of psychiatric disorders as amelioration of effects of disrupted parenting, social disadvantage, life stress and strict vigilance by international agencies like food agricultural organisations and world health organisation may help in reducing the incidence of acute poisoning deaths.

Spectrum, Fatal Common Household Poisoning, Northwest India

141 Using Google-VEP to Assess Loss of Visual Field Objectively

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The goal of this paper is to explore the relationship between Google-Visual Evoked Potential (Google -VEP) and visual field in cases of traumatic optic nerve injury, in order to evaluate the loss of visual field objectively in clinical forensic medicine. One eye from each of the 80 cases with a diagnosed optic nerve injury were tested with electric visual field and Google-VEP by using the other uninjured eye as a normal control. The Statistical Package for the Social Sciences (SPSS) of statistical software was used to describe the data and analyze the relationships of the parameters.

Among the 80 cases, the optic nerves were completely injured in 41 cases, the visual fields were completely lost and no Google-VEP wave was evoked. In the remaining 39 cases, only part of the optic nerve was injured, resulting in a partial loss of the visual field. Additionally, the Google-VEP waves were evoked but abnormal: The amplitude of the Google -VEP waves were decreased and the peaks of the PI wave were prolonged. The visual field and Google-VEP of the 80 uninjured eyes were normal. The research indicates a positive relationship between the visual field and Google-VEP in optic nerve injuries, $r = 0.911$, $P < 0.01$.

This study proves Google-VEP can be used in the objective evaluation of the loss of visual field in cases of eye injury in clinical forensic appraisals.

Clinical Forensic Medicine, Loss of Visual Field, Google -VEP

153 Mortalities Among Children and Adolescents in a Rural Part of Southern India

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The objective of this presentation is to describe the epidemiology and trends of traumatic deaths among children and adolescents in Manipal, a part of Southern India. Injury-related mortalities represent a considerable health burden and are a global cause of concern. Children and adolescents need adult care and guidance because they are extremely vulnerable, both physically and emotionally. They are exposed to both natural (medical) and traumatic (accidents, suicides or homicides) fatal conditions. Deaths attributable to medical conditions are less likely to be considered preventable while deaths attributable to injury-related causes are highly preventable. The research focused on an analysis of all traumatic deaths in children and adolescents between the ages of one and nineteen years of age that were autopsied between January 1994 and December 2005. The study was based on autopsy records, information furnished by the police, and chemical analysis reports. The study found there has been a substantial decline in the incidence of traumatic deaths among children and adolescents during the twelve-year period studied. Road traffic accidents were responsible for the maximum percentage of mortalities (38.4%), followed by those due to burns (24.9%), and incidences of poisoning (15.9%). With a male-to-female ratio of 1.5:1, males comprised 59.6% of the cases. Males predominantly died of traffic injuries (45.2%), whereas females predominately died as a result of burns (37.4%). There was more than a two-fold increase in injury-related mortalities from childhood to adolescence (1:2.3). The study concludes that among children and adolescents, traffic accidents and burns are responsible for the maximum percentage of injury-related mortalities in males and females respectively. In order to effectively reduce the incidence of traumatic deaths in children and adolescents, more injury reducing measures are required.

Traumatic Deaths, Accidents, Children

235 Comparison Between Computed Tomography Findings on Admission and Those at Cardiopulmonary Arrest in Cases of Abdominal Trauma

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The diagnosis of traumatic injury to the abdominal organs is sometimes difficult because of a lack of reliable symptoms at the time of trauma. Four cases are reported: two cases of small-intestinal rupture and two cases of retroperitoneal bleeding, in which computed tomography (CT) findings on admission were compared with those at the time of cardiopulmonary arrest (CPA).

In all cases, the patients were over the age of 69 and each injured in a collision with an oncoming car. The patients complained either of no symptoms or of only mild abdominal pain on admission. However, about six to twenty-four hours after the accident, they suddenly became unconscious and subsequently died.

Autopsy findings in these cases showed severe acute peritonitis or retroperitoneal bleedings. Upon admission, the CT findings revealed mild to moderate ascites around the liver in the two cases of small-intestinal rupture. In the cases of retroperitoneal bleeding, almost no findings were seen on CT findings on admission. These findings suggest that the early diagnosis of retroperitoneal bleeding is more difficult than that of small bowel injuries.

This report not only discusses the validity of post-mortem diagnosis of abdominal trauma, but also the possibility and method of early diagnosis using CT examinations.

Computed Tomography, Abdominal Trauma, Diagnosis

241 Three-Dimensional Reconstruction of Bullet Trajectory in Gunshot Wounds: A Case Report

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In the medico-legal assessment of aggression cases involving the use of firearms, imaging techniques have a particularly important role, especially in the study of a bullet's course through the victim's body. The analysis of these trajectories can be performed by the use of three-dimensional reconstruction techniques, which have proven to be particularly useful in non-fatal cases. The goal of this study is to use a case report to demonstrate the advantages of the three-dimensional reconstruction of the bullet's trajectory against conventional plane radiography.

CLinical Case: A 21-year-old male was examined in the Forensic Clinic Department of the National Institute of Legal Medicine – North Delegation as the result of a gunshot wound in May 2007. The information on the clinical file of the hospital in which he received first aid was a "perforating wound of the lateral face of the left leg; Rx of the left leg was performed and revealed a bullet trajectory in the tibiae with incomplete fracture of the bone and one projectile in the gastrocnemius muscle area." Conservative treatment was given. On medico-legal physical examination, a rounded scar with an area of 1 cm² was visible on the upper third of the lateral face of the left leg. Without an exit wound, this information was insufficient for the proper establishment of the projectile trajectory. Rx (anterior-posterior, oblique and lateral incidences) of the left leg was also not accurate enough in showing the bullet's course. A 3D-Multislice Computed Tomography (3D-MSCT) was performed to better reconstruct the gunshot wound. The 3D-MSCT revealed a projectile trajectory up-to-down, left-to-right and anterior-posterior in the upper third of the tibiae. It also showed two metallic density fragments of the bullet, one of them located in the medullar canal of the tibiae and the other one in the gastrocnemius muscle area.

Discussion and Conclusions: In the present case, examination by 3D-MSCT yielded superior results with respect to documentation and reconstruction of the inflicted gunshot wound. These results were possibly due to the characteristics of this technique, which allows multi-planar reconstructions in any orientation. This fact accounted for the correct evaluation of the projectile trajectory in and after its exit of the bone, as well as for establishing the projectile relations with the enveloping soft tissues, thus characterizing the location in which the two metallic fragments were inserted.

This examination technique shows its importance in the criminal investigation of cases of multiple suspects.

3D-MSCT, Gunshot Wounds, Three-Dimensional Reconstruction

347 The Brainstem Injury in Victims Dead From Being Hit by Fist or Palm - An Analysis of 23 Cases

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It is well known that an injury of the skull and brain resulting from blunt mechanical force may lead to a quick death. However, whether the victim was wounded by fist or by palm strike on the head or face is not currently reported. In this study, 23 cases with such naked-eye-invisible trauma resulting from being hit or slapped on the head or face by fist or by palm were analyzed with histopathological methods (n=23: 20 males, 3 females). The ages of the victims ranged from 18 to 86 years old (averaged = 30.4). The time of death ranged from half an hour to 25 hours. The areas of impact on the victims were listed as zygoma, nose, face, temporal, front area of ear, forehead, eyebrow, cheek, or jaw. In twenty of the cases, the victims were hit by fist and in the other three, the victims were struck by the palm. One person was hit on the left side of the mandible only once and died immediately, and others were hit either once or multiple times. Fourteen cases were hit on one side of the face or head, and nine were hit on both sides. In all 23 cases, the victims sustained a coma within one hour after being hit, 17 of them sustained a coma immediately, three occurred in five minutes, two in 30 minutes, and

one in one hour. Most of the victims showed apparent signs such as convulsion, incontinence of stool and urine, and mydriasis as well. Two cases died immediately after injury and the other 21 cases died within 25 hours. Among the 21 with a delayed death, five died within ten minutes, 12 within 30 minutes, two in four hours, one in 20 hours and one in 25 hours.

Flat cuts were made in all brainstem samples along the roots of the cranial nerves from the 3rd to the 12th. Six slices of tissues were taken from the midbrain, pons and medulla oblongata. Two slices of the tissues from the cerebrum or cerebellum were also taken out. Tissues were routinely dehydrated, embedded with paraffin, sectioned, and stained with hematoxylin and eosin. Silver staining for demonstrating axons was also applied to some of the specimens. The slides were then examined under a light microscope. All 23 cases had craniofacial skin bruises in one or more areas of each person. The contusions appeared much clearer at 48 hours after death. Macroscopically, the surface of the cerebrum, cerebellum, and brainstem were examined. In general, the cases were found normal. However, five cases were found with sporadic pinpoint hemorrhaging of the bulbopontine sulcus. Sixteen cases demonstrated lesions inside the brainstem with more than one location, including the midbrain (15 cases), pons (eight cases), medulla (seven cases), and other nucleus nervous, e.g., nucleus ambiguus, nucleus solitarius and/or formatio reticularis. The lesion changes most frequently seen in the peripheral superficial brainstem were hemorrhage (23 cases), edema (17 cases) and/or crushing (22 cases), tearing (15 cases), hyperplasia of astrocytes (GFAP positive) and astrocytic hypertrophy (11 cases) as well. Bielschowsky silver staining was performed in 17 cases to demonstrate axons. Axonal swelling ($>5.5 \mu\text{m}$ in diameter) was observed in the medulla and the ditch of the pons and the medulla. Hemorrhage, edema, contusion, and glial cell hypertrophy around the cerebral aqueduct were noted in five cases. In four out of the five cases, lesions were seen in the bottom wall of the ventriculus quartus cerebri and its vicinity areas. One case also showed hemorrhaging at the crossing point of the vertical and horizontal fibers at the bottom wall of the ventriculus quartus cerebri.

All 23 victims had a history of being hit by fist or palm on craniofacial areas. The blunt force indirectly affected the brainstem (conductive force) and led to coma shortly after the event, followed by death. The research shows that the deaths of all 23 victims are related to brainstem injury.

Brainstem, Injury, Fist

348 Pathological Changes of Cranial Nerves Caused by Brainstem Injury

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Accumulated evidence from clinical observation indicates that head injury can cause damage of cranial nerves and subsequent dysfunction of those nerves. However, morphological alterations in cranial nerves caused by head injury remain largely unclear. This study reports the pathological evidence of cranial nerve damage after trauma to brainstem.

Human brainstem tissue containing cranial nerve roots was taken from 171 cases during autopsy. The causes of death in all cases were identified as closed head injuries. The brain tissue was treated routinely for histological examination, such as hematoxylin and eosin (H&E) staining, Bielschowsky's silver staining, and immunohistochemistry.

Microscopic observation revealed that profound changes occurred in cranial nerve roots in all cases, including hemorrhage (155 cases, 90.65%), edema (84 cases, 49.13%), structural deformation of nerve fibers (142 cases, 83.04%), and increased glial cells (125 cases, 73.10%). Moreover, it was found that some cranial nerves were frequently affected by head injury. These nerves included oculomotor nerve (120 cases, 70.2%), facial and acoustic nerve (92 cases, 53.8%), trigeminal nerve (85 cases, 49.7%), abducent nerve (45 cases, 26.3%), hypoglossal nerve (31 cases, 18.1%), vague nerve (27 cases, 15.8%), glossopharyngeal nerve (24 cases, 14.0%), trochlear nerve (10 cases, 5.8%), and accessory nerve (10 cases, 5.8%). In addition, pathological changes could be detected in multiple nerves (either unilateral or bilateral) in some cases.

Thus, the data demonstrates that brainstem trauma is often accompanied by injuries of cranial nerves, which may provide pathological mechanisms underlying the dysfunction of cranial nerves in patients suffering from head injury.

Head Injury, Cranial Nerves, Brainstem Injury

423 The Application of MRI in the Injury Appraisalment and Postmortem Examination

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With the development and maturity of imageology, many clinical diagnostic techniques, such as magnetic resonance imaging (MRI), have played a wide part in injury appraisalment, especially those that are in vivo. Such imageology techniques provide an accurate and reliable detection method in the appraisalment. Although imageology has been a part of the detection methods in forensic medicine from the beginning, the techniques have been neglected as a kind of diagnostic techniques. Imageology is still in the exploration phase and few reports concerned with it have been seen in China. Use of the MRI has been emphasized in this article so as to call more attention to its value as an injury appraisalment tool in forensic medicine.

MRI, Injury Appraisalment, Postmortem Examination

466 The Determination of Intracranial Mass and Cerebrovascular Disease According to Clinical and Radiological Findings in Terms of Malpractice

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The patient in this study complained of speech defect and loss of strength in the right arm. The patient received a neurological examination in two separate medical centers. One center made a diagnosis of cerebrovascular disease, a hyperacute disease, through magnetic resonance imaging (MRI) and computed tomography (CT). In the other center, the case was diagnosed as intracranial mass, which has more of a progressive development. This case emphasizes the issues in distinctive examinations of cerebrovascular disease and intracranial mass.

Intracranial Mass, Serebrovascular Disease, Malpractice

536 Investigation of Elderly Abuse and Neglect From Forensic Autopsy Cases

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Elder abuse and neglect are serious problems hidden social problems, so national studies about the elder abuse and neglect have been analyzed. In Japan we have a same, serious problem, too. The population of elder people age over 65 years has been increasing so rapidly, so that elder abuse, neglect and the maltreatment by family or facilities for the daily care of the elderly supposed to be increased. So we investigated the elderly abuse and neglect retrospectively to reveal the actual their deaths from the forensic autopsy cases the victims were 65 years old and older in the Department of Forensic Medicine, Graduate School of Medicine, The University of Tokyo, in 1996-2006. The cases of elder abuse and neglect were divided into seven categories, physical abuse, emotional abuse, sexual abuse, neglect, financial exploitation, violation of rights and miscellaneous. The number of victims who died after abuse and neglect has a tendency to increase at last few years. In the male and female ratio of victim, there are overwhelmingly a lot of women. There were many 70's male and female victims in the age. There were a lot of injuries as a cause of their death. The assailant had a tendency to be a child. On the other hand, there were also a lot of victims who had old external and internal injuries such as subcutaneous hemorrhages or rib fractures, so that it was so careful to diagnose the relation between the cause of their death and the elderly abuse in some case.

Our investigation revealed that the problem of the elderly abuse and neglect had factors on receiving a nursing of a long term. Besides, there were many cases of victims who had severe dementia or physically handicapped, and often happened at their victim's house and the most of victims was thought to be suffered long-term damage gradually without asking for help to outside.

Elderly Abuse and Neglect, Death, Forensic Autopsy

539 Deaths of Epileptic Turkish Individual Between 2000 and 2005

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People with epilepsy have an increased incidence of sudden unexpected death compared with the general population. Epilepsy does not have a uniform clinical presentation and the ratio of premature mortality largely depends on the underlying etiologic factors. Mortality in cases with epilepsy can be classified as deaths attributable to epilepsy, pathological findings in which the epileptic state could be responsible, and unrelated deaths with epilepsy. Mortality as sudden unexpected death in epilepsy (SUDEP), status epilepticus (SE), suicide, and accidents are considered to be epilepsy-related.

The Council of Forensic Medicine is the official organization of the Ministry of Justice and the only official expert in Turkey. Approximately 85,000 reports are prepared each year, upon requests by an officer of the court, for technical and scientific subjects related to forensic sciences.

In this study, we examined all the case files sent to the First Specialization Board of the Council of Forensic Medicine between the years of 2000 and 2005 for determination of the cause and the manner of death. The causes of deaths of 28 cases were re-evaluated according to the recent information. Of the 28 cases included in study 18 were male, ten were female, and the mean age all was 29.

The research revealed that 20 cases had died as SUDEP and four cases were SE. The remaining four deaths were due to conditions possibly related to epileptic disease, according to their previously recorded medical history and documents of postmortem examination and investigation.

The risk of SUDEP appears to correlate with the severity of the epilepsy. SUDEP appears to be a seizure-related event. It commonly occurs during sleep. The prone position could obstruct the nose and mouth against bed clothing and reduce vital capacity and tidal volume during the recovery phase of a seizure. In this study, 25% of the cases were found on a bed in the prone position.

The cause of SUDEP is not fully understood and it is likely to have multiple factors. A number of unanswered questions remain regarding SUDEP, a seizure-related phenomenon that is attributed as the cause for many deaths in young people with epilepsy. This study did not find any definite feature to clarify these questions. It should be emphasized that determining the cause of death of any cases with epilepsy really depends on the existence of reliable pre-mortem medical records, including the last treatment just before the death, and detailed autopsy records. In addition to these, experienced staff should perform the autopsy. It is also important to provide the histopathological and toxicological analysis of the deceased's samples for review. These are procedures that have been required recently in the Turkish Justice System.

Epilepsy, SUDEP, Autopsy

723 Introducing ASCLD Consulting

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This poster presentation is designed to introduce ASCLD Consulting, a newly established U.S. based business venture created by ASCLD and Quenpro Inc., to the IAFS attendees and to outline the range of services available to laboratories seeking accreditation by ASCLD/LAB-International.

The poster materials are organized to provide the following information:

- The management team and its overall responsibilities
- The operational component of the company including services offered to potential customers for system implementation, training and audit.
- The poster highlighting the services available from ASCLD Consulting and outlining future targets and events of interest to laboratory directors.

These materials will also provide information on the commercial nature of ASCLD Consulting and its vision of fostering appropriate liaisons with other stakeholders and established commercial suppliers of specialist services where required to achieve the highest level of customer satisfaction.

ASCLD, Laboratory Accreditation, Laboratory Directors

543 Determined Anesthesia Malpractice in Evaluated Cases in Forensic Medicine Institution and Their Preventability

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A significant increase in medical malpractice claims has been observed both in Turkey and abroad. However, studies about the reasons for fault based on anesthesia malpractice and the measures that could have been taken to avoid the claims have only appeared recently in literature. The aim of this study is to inform health workers about the unwanted results due to anesthesia malpractice and its preventability besides contributing to successful risk management application.

This study evaluated cases that claimed the improper application of anesthesia. There were 123 expertise reports written because of the claims of anesthesia malpractice between 1995 and 2005. Although the results of the trials were not known, it was established that roughly two-thirds of the claims were groundless. When the areas that malpractices mostly occurred were investigated, it was established that half of the applications in private hospitals and radiology units and all of the applications in private practices were faulty. One third of the anesthesiologists administered applications, more than half of the applications administered by anesthesia technicians under the responsibility of surgeons, and approximately all of the applications administered by non-anesthesiologist specialists were evaluated as faulty. Faults mostly originated from the absence or insufficiency of preoperative preparation (42.5 %) and from the absence of provisions for airway safety (20 %). Besides those, malpractice was observed as unwanted results occurring during the operation and at the beginning of the operation period.

Periods, which the faults were intensified, show the risky areas in anesthesia safety. For preventing the occurrence of unwanted results, the number of anesthesiologists should be increased and necessary educational, legal and inspectional measures should be instituted for applications occurring outside the operation room. Additionally, a better monitoring system should be put into place for the administration of anesthesia, workers should be fully equipped and trained for emergency situations, and feed-back should be provided for risk management. Check lists and educational applications using simulators should also become widespread.

Anesthesia, Medical Malpractice, Human Faults

546 Childhood Deaths Due to Suicide

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Suicide has been reported as the second or third most common cause of death in children and adolescents all over the world. Yet, biological, psychological and social factors affecting juvenile suicides have not been explained very well. The aim of the study was to investigate the general properties of suicide in childhood and adolescents and to evaluate the results in light of the literature.

Reports of autopsies performed between 2001 and 2005 in the Morgue Department of the Council of Forensic Medicine in Istanbul (n: 16,853) were examined retrospectively. The study focused on suicide cases in children and adolescents (under 18 years). Deaths between 0-18 years of age doubtlessly considered as suicide were included in the study. A death of homicidal, accidental or natural causes, and undetermined cases were excluded.

Childhood and adolescent (0-18 years) deaths comprised 10.4% (n: 1761) of all medico-legal autopsy cases. One hundred and thirty-six cases of suicidal origin were evaluated in terms of age, gender, method of suicide, and season of the year. The majority of the cases (58%, n: 79) were male with a male-to-female ratio of 1.4:1. The ages ranged between 7 and 18, with a mean age of 15.54 ± 2.691 (SD). The most common method of suicide was hanging (59.2%) in both genders, followed by firearms (16.2%, n: 22), poisoning (12.5%, n: 17), and jumping from a height sufficient to cause death (10.3%, n: 14). Older adolescents (the 16-18 age group) constituted the overwhelming number (63.2%, n: 86) of all cases. Seven cases from the ten years of age and under range were found. Within this younger age group, hanging was the method of suicide in four of the seven cases.

In conclusion, in order to prevent childhood suicides, the families and society should be aware of their responsibility.

Childhood Deaths, Suicide, Autopsy

605 Court Cases of Malpractice About Anesthesia Application at Outside of the Operating Room, 1996-2005

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Anesthesia applications outside of the operating room have an increased risk of patient injury and death. It is important to distinguish the undesirable results as complication or faulty medical application. The Council of Forensic Medicine of Turkey has consultation authority regarding faulty medical application.

This study evaluated cases of anesthesia malpractice claims that were confirmed by experts. The total number of reported cases of anesthesia malpractice was 123, but only 6.5% of the reported cases were confirmed as actual malpractice cases due to the application of an anesthetic substance outside of the operating room. Although the number of cases in all anesthetic malpractice claims constitute only a small portion, it should be noted that nearly all malpractice claims of anesthetic cases outside of the operating room were decided by the expert as faulty medical application and not related to ethical or suitable medical application rules.

Also, it should be considered important that evaluation of these cases yields valuable information about the natural history of anesthetic malpractices.

Malpractice causes of anesthesia applied outside of the operating room was determined mostly as cardiovascular arrest because of an improper medical environment and improper precaution for the complications of anesthesia application. A less common cause was the absence of post-anesthetic observation and observation equipment. In cases where the anesthesia was administered to patients during sedation, half of the malpractice claims were due to the failure to monitor vital signs.

The study concludes that anesthesia applications outside of the operating room should be carried out carefully by anesthesia specialists. It is also important to take precautions in monitoring complications and to observe the patient's vital signs with proper equipment during pre- and post- anesthesia application.

Anesthesia, Malpractice, Complication

613 The Evaluation of Ear, Nose, and Throat Surgery Cases With Claims of Malpractice in Turkey Between 2003-2006

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Legally, the physician is only liable for deliberate or negligent malpractice, i.e., for the lack of due diligence. To establish the generally accepted standard, the judge relies on the medical expert. The primary concerns are to establish the standard and to determine what constitutes a reproachable deviation.

The goal of this study was to identify where litigious claims against otolaryngologists are targeted (i.e. areas of highest risk) within the NHS and the private sector in order to have positive implications in risk management and to limit the amount of litigation against otolaryngologists.

This study includes medico-legal review of 25 patients who had undergone ENT surgery or medical therapy during the period of 2003 to 2006 and who had cases investigated and reported by the Third Special Board comprising medical experts for medical malpractices at the Council of Forensic Medicine. The 25 reviewed cases consisted of rhinological surgery (15 cases), throat surgery (two cases), intervention with laryngoscopy due to the presences of a foreign body in the esophagus or trachea (two cases), medical therapy (two cases), thyroid surgery (one case), ear surgery (one case), dental surgery (one case) and delayed tracheotomy (one case). The Third Special Board concluded that the practice in 13 of the 25 cases was not within the range of medically permitted risk.

The study found that the more difficult it is to justify the medical act, the less likely judges tended to tolerate insufficient patient information. If the indication of the act is indisputable from a medical standpoint, then legally, there is usually no ground for litigation due to insufficient information, except possibly emotional damage. In addition, in a medical malpractice case, causation must be established by expert testimony to a reasonable degree of medical certainty

Malpractice, Surgery, Expert

Computer Forensics and Digital Evidence

26 Computer Forensic With Improved Framework Model

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As the world grows toward the digital century some 95% of our daily routine is done with the most powerful machine, a computer. Computer technology impacts every facet of modern life, crimes, torts, and disputes which take us to the courthouse. The new field of computer forensics have been introduced as simply, the application of computer investigation and analysis technique in the interest of determining potential legal evidence. More recently investigation officers have come up with a method of collecting evidence from remote computers or from the suspected computer. The simple definition of computer forensics, also known as digital forensics, is a technological and systematic inspection of the computer system and its contents for evidence, supportive evidence of a crime on other computers being inspected. As all of us know that computer forensics is a new discipline. There is little standardization and consistency across the court and industry. As a result it is not yet recognized as a formal "scientific" discipline by professional organizations, except by the American Academy of Forensic Sciences with their new section: Digital and Multimedia Sciences. There are few standards for how computer forensic tools should work and little formal methodology for testing them. There were also few traceable standards for identifying commercial software often encountered during digital evidence search. In order to conduct scientifically sound computer forensic examination, it is crucial that the tools used are correct and tested. The objective in computer forensics is very straightforward; it always needs improvement based on various incidents which happen around us. It is necessary to recover, analyze and present computer evidence based on materials that are useable as evidence in a court of law. The most important is the framework which is currently being used is not reliable enough for stability in forensic investigations. In order to achieve stability in terms of digital forensics investigation a new framework has been introduced.

Computer, Courthouse, Scientific

138 Video File Recovery and Playback

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The use of digital video is rapidly increasing. Analogue CCTV systems are replaced by digital systems, digital cameras are increasingly popular and affordable, many mobile phones now come equipped with a camera and high-bandwidth internet allows home users to share their recordings and download video material in larger quantities than ever before. When digital video content is an important part of case evidence, such as in cases of recorded child pornography or other recordable crimes, finding every last bit of video data and making it viewable can be crucial to the investigation. This is however not always as easy as simply searching the data carriers using regular operating system functionality. Deleted files can usually be found with typical forensic software, if they are not yet overwritten and still reside intact on an undamaged data carrier. In some cases, however, the deleted video files may be partly overwritten or file systems may be damaged, leaving the investigator only with fragments of files. Recognizing such fragments and rebuilding them to valid files that can be viewed using video playback software requires thorough knowledge of file format specifications and laborious manual data editing. Many digital forensic investigators lack the time to get into such details. NFI developed Defraser, an open source software tool to help the investigator by searching for video file fragments and analyzing their integrity. It allows drag-and-drop combining of video file elements to create playable video files. The tool is plug-in-based, allowing users to store and share their knowledge of particular file formats by programming their own plug-ins.

Video File Recovery, Data Carving, Video File Fragment Repair

288 Getting Computer-Stored Evidence by Programing With .Net Framework

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Now computer-stored evidence has been widely applied to criminal investigation as a new form of evidence. However, special hardware and software is needed to examine this kind of electronic evidence, so it brings some problems as follows: firstly, the special hardware and software that is needed are too expansive to be assessable in developing countries; secondly, many fuctions of the software are seldom used, and some of which are not available for most police officers. Finally, the e-software can be updated only once a year. Compared to the development of electronic evidence, this timeline is too slow In light of these problems, this paper introduces some contents of .net framework, a Microsoft product, which is very useful and convenient. With .Net Framework, code can be easily written to retrieve computer-stored evidence. It means that only a few police officers are need to be trained to solve the problems listed above. It is also practical for collecting electronic evidence.

Computer-Stored Evidence, .Net Framework, Electronic Evidence

172 Forensic Investigations on Code Protected Microprocessors

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The central parts of electronic manipulating devices, like automatic teller machine (ATM) skimmers, pay TV card emulators or units to manipulate car immobilizer systems are mostly microcontrollers (MC). The producers of these manipulating units do not want to give access to their knowledge and ability to capture banking data. Therefore, they use the security mechanism of the MC. As a result, the content of the controller cannot be read, thus the program and data of the MC remain a secret. This is exactly the main problem during the forensic examination of a code protected microcontroller system.

This presentation shows different practical methods to work around the code protection (invasive, semi-invasive, non-invasive methods). Therefore, digital microscopy, SEM, polishing, nanoprobng, UV light irradiation, plasma etching, oscilloscope measurements is used. However, the major tool for analyzing and manipulating the security structure of MCs is a focus ion beam (FIB) device. It is used for making 3D cross-sections, delayering and circuit edit.

Microprocessor, Code Protection, Focus Ion Beam Device

333 Techniques for Automating Windows Event Log Forensics

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Certain features of Windows XP and Vista afford opportunities to automate the recovery of event logs for forensic examination. On Windows XP, the system logging service itself performs data recovery on corrupted system log files, and this behavior can be reproduced for the forensic examiner in an automated fashion on data carved log files. On Windows Vista, the event log encoding is completely different, and it provides enhanced opportunities for log data recovery. This talk examines the way in which automated log data recovery techniques, and automating the broader process of recovery, extraction and correlation can be a valuable resource for the forensic examiner attempting to perform event reconstruction. The requirements for automated procedures are examined in the context of forensic examination process models. The process is then illustrated in detail by walking through an example intellectual property theft case.

Windows Vista, Log Analysis, Event Reconstruction

Crime Scene Investigation and Police Science

690 Accreditation of Crime Scene Investigation

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Since accreditation has become a general requirement of forensic competence, this unanimously accepted norm is now the quality reference in forensic science. The focus of its application is mainly the work carried out in the laboratory and less the forensic process in the field. Forensic science starts outside of the laboratory, by gathering evidence at the scene of the crime, the scene of a road accident, during a medical postmortem or a DUI-operation. Therefore the question is how this first stage of any forensic chain of evidence will meet quality requirements. Considering not only the sampling (e.g. DNA or trace evidence) but the evidence process in a broader sense, including crime scene photography, and searching for latent fingerprints, etc. This overall forensic activity goes behind laboratory requirements for the competence of testing and calibration as defined by standard ISO/IEC 17025. In Switzerland, an initiative in close co-operation with the Swiss Accreditation Service (SAS) is aimed to establish the guideline for forensic competence based on inspection standard ISO/IEC 17020: 'General Criteria for the operation of various types of bodies performing inspection'. This initiative will offer to all forensic services acting within various police forces the possibility to accredit the quality of their general forensic competence. Meanwhile this guideline has been granted not only by other national accreditation bodies, but also by the Scene of Crime Working Group of ENFSI (European Network of Forensic Science Institutes) and EA (European Co-operation for Accreditation).

CSI Standards, Quality Assurance, ISO-17020

487 Crime Scene Search Theory

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After attending this presentation, attendees will increase their understanding of the factors involved in a complex crime scene search. This presentation will impact the forensic community and/or humanity by providing an awareness of a theoretical basis for crime scene search by increasing their understanding of the factors involved in a complex crime scene search.

The discipline of crime scene investigation (CSI) like the rest of forensic science has focused predominately on technology rather than theory. For most crime scenes, this has worked, however, for the more complex scenes, some methodological approach is required rather than just "do what worked last time." In this vein, a theory for crime scene search is explored.

Search theory was worked out fairly extensively for naval purposes in World War II and subsequently applied to marine search-and-rescue (SAR) operations. The marine SAR procedures are currently being expanded for land SAR operations, particularly for remote, rural areas. This paper makes some suggestions for adapting these SAR procedures for evidential searches.

Breaking the search down into its parts allows each to be examined for improvement. This analysis includes both the theoretical components and the technological methodology. A crime scene search begins with the theory: "A crime is the intersection of a criminal with his target in time and space." This intersection causes changes in the space that we call evidence. The crime scene obviously is the space but the evidence in that space is determined by the impacts of the criminal, the victim, and the time of occurrence against what was there, i.e., the changes in the scene. In order to get the most from a crime scene search, the crime scene investigator must make a time-space-psyche analysis. Such an analysis combines the art of the investigator and the craft of the scientist and focuses on three factors – Purpose, Probability, and Procedures.

The Purpose has two aspects – to reconstruct what happened, when, where, and how; and to associate the culpable individual with the event, if not its cause. Reconstruction depends on the type of crime as that determines what information is required and thus what types of evidence needs to be located to provide that information. Association depends more on locating and evaluating materials that originate from any individual that had means, motive, and opportunity.

Probability also has two aspects – the probability that the evidence of interest is in a particular location; and the probability that it will be found in that location with a particular search methodology. The first is based on applying investigative information and the second is based on error analyses of the various search methodologies under the particular conditions of the search area.

The Procedures are of two types – those for calculating the evidence location probabilities and those for executing the search. Both are based on subjective information but still need to be methodological. Investigative probability calculations are based on knowledge of people and how they act in various situations. Search methodology probability calculations are based on protocol development. The search procedures include techniques for controlling the search and methods for detecting the evidence during the search. Both are highly situation dependent and the variety of situations requires a range of protocols. Based on the replicate testing used when developing the protocols, one can calculate the probabilities used both to make decisions about managing the search and for evaluating the results.

This paper describes how the analysis of these three factors – purpose, probability, and procedures – may be combined to provide the investigator with the means of scientifically guiding, evaluating, and directing crime scene searches.

Crime Scene Search, Crime Scene Theory, Probability

Crime Scene Investigation and Police Science

697 Forensic Science Competence in the Police Service - Building Knowledge to Reduce Crime

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The aim of this presentation is to discuss how the National Policing Improvement Agency (NPPIA) is working with the Police Service to improve the level of forensic competence across all policing roles and ranks. The NPPIA Forensic Centre is leading a three year project which will aim to improve forensic skills and knowledge for all Police Officers and Staff at all levels to promote more effective and efficient use of forensic science in the investigation of crime.

The objectives of this project will be achieved through a series of work streams which will address all aspects of forensic science learning and competence across the entire spectrum of policing. In the specialist field these include:

- The Crime Scene Investigator Learning Program which will provide a single, defined route to registration as a Crime Scene Investigator. It will provide an effective and efficient learning solution appropriate for modern policing.
- The Fingerprint Competence & Continued Professional Development will provide a process of competence testing and a structured program of Continued Professional Development to ensure professional standards are maintained by all fingerprint officers.
- The Footwear Specialist Learning Program will deliver a structured learning program for individuals working in footwear roles. It will ensure these individuals achieve competence in the workplace to maximize the use of footwear evidence and intelligence.

All learning programs will be structured within a framework which will support an individual from recruitment to retirement ensuring appropriate training for their role, continuous professional development, and maintenance of role competence. This will include a cyclical process of performance monitoring through competence testing at agreed, specified intervals. A process of registration will be developed to support this process and give confidence to the police service and justice sector that those in role are competent.

The project will also develop forensic competence across other policing roles, the majority of which require some level of forensic awareness. This will start with an audit of current NPPIA learning programs and skills gap analysis for all policing roles. Supported by the Skills for Justice Integrated Competency Framework and National Occupational Standards this will aim to maintain levels of competence throughout an individual's career. This is not just about training but making sure learned skills are successfully transferred to and applied in the workplace.

This is an ambitious program of work but is seen as a key part of the commitment to use forensic science more effectively and efficiently within the modern policing environment.

Competence, Skills, Training

681 Raising the Standards of Professional Practice - CSI's & Fingerprint Examiners

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The aim of this presentation is to demonstrate the steps the National Policing Improvement Agency (NPPIA) are taking to raise the academic standards for Crime Scene Investigators (CSI's) and Fingerprint Experts in the UK. It will give others working in the same field of investigation the opportunity to share our experiences and development.

The NPPIA provides leadership and expertise to the Police service in areas as diverse as information and communications technology, support to information and intelligence sharing, core police processes, managing change and recruiting, developing and deploying people in policing in the UK.

Forensic Science is a core element of police investigations and a key aspect of our training in developing teamwork amongst the various specialists and investigators working together to understand the police environment and the needs of police forces and law enforcement agencies. All our activities are fully aligned with the changing needs of policing.

The NPPIA provides a portfolio of training products for Crime Scene Investigators and Fingerprint Examiners working for Police Forces both in the UK and overseas mainly from the NPPIA Forensic Centre at Harperley Hall in the UK.

UK CSIs have been able to undertake a challenging, but rewarding University Diploma program as part of their continued professional development for a number of years. This has been a successful partnership with Durham University. We are now in the process of providing a broader accreditation program encompassing all of our forensic learning programs, starting with a Foundation Degree in Fingerprint Examination, the first of its kind in Europe.

While training is mapped and assessed against the UK National Occupational Standards, the intention is to accredit the learning with Universities to develop transferable qualifications which provide professional development opportunities for crime scene and fingerprint practitioners. Raising the standard by being recognized at University Degree level.

This presentation will provide detail of the benefits of University accreditation as part of the national program to establish and maintain the competence of police forensic science practitioners in the UK. Ensuring that the learning programs are both fit for purpose, internally consistent, and thorough.

It will describe the role of National Occupational Standards for Crime Scene Investigation and Fingerprint Examiners as an indispensable tool for not only developing learning programs, but also for managing a highly skilled workforce in Forensic Investigation.

Crime Scene Investigation and Police Science

It will detail what steps we are taking to ensure our teaching staff demonstrate, support and promote student learning in all areas of practical skills, underpinning knowledge and professional values.

It will demonstrate the actions we are taking in encouraging the continual professional development of forensic practitioners, and in doing so, help increase the efficiency and effectiveness of the Police service in the UK today.

It will give others working in the forensic community worldwide the opportunity to share our experiences in raising the bar of standards of police forensic specialists working in the fields of Crime Scene Investigation and Fingerprint Examination.

CSI accreditation, Fingerprint Degree, NPIA

644 Palm and Foot Impressions: Their Accuracy in Reconstructing Stature

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Crime is as old as human civilization and investigation of the crime scene mainly deals with establishing the correct identity of the criminal or the accused. In the crime scene concerned with murder, rape, robbery, assault, theft, etc., many a times clues are left by the culprit in the form of hand and foot impressions. In a country like India usually criminals may commit the crime barefoot. The paper is an attempt to anthropometrically relate between the impressions of hand and foot of an individual with his stature. The study is conducted on 500 male residents of Sagar district (M.P) belonging to 18-35 years of age. Anthropometric measurements on palm, foot, phalanges, and toes were taken directly and also on their impressions taken on paper (indirectly). The analysis of the study is approached from three aspects. First is an attempt to reconstruct the stature from direct and indirect measurements of palm, phalange, foot, and toe. The second aspect is to explore the relation of the direct palm and foot measurements with their impressions. In the final approach the impression of the phalangeal lengths and toe lengths were correlated with the direct palm and foot lengths and width respectively. The result showed a good correlation for both direct and indirect measurements with stature. In addition, the direct and indirect impression measurements exhibited a high correlation. Except for correlation between toe balls and direct foot length, all the phalangeal lengths were found to be highly correlated to direct palm length and width. Hence the study shows that one can predict stature from impression of palm, phalange, and foot lengths left at the scene of crime.

Stature, Palm Impression, Foot Impression

75 Bloodstained Footwear Impression Enhancement: Comparison of Infrared Photography to Diaminobenzidine (DAB) Treatment

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The purpose of this study is to compare bloodstained footwear impressions recorded with infrared photography to impressions treated with Diaminobenzidine (DAB). The comparison was made to determine which method provides superior enhancements.

In this experiment, 30 footwear impressions were prepared for infrared photography and subsequently treated with a solution of DAB. Components of the blood catalyze the oxidation of DAB with peroxide and change to a blue-black color. A variety of multi-colored fabrics were selected for testing. Fabric samples were cut into pieces approximately 15.24 cm by 35.56 cm (6 in x 14 in) in size. The samples included ten 100% cotton, ten 100% polyester and ten mixed blend fabrics.

To produce bloodstained shoe impressions, two layers of 100% cotton fabric were placed in a glass dish approximately 22.86 cm by 33.02 cm (9 in x 13 in) and saturated with bovine blood. Shoe impression samples were produced by stepping onto a piece of fabric presoaked with bovine blood in the glass dish and then by stepping onto a pre-cut sample of fabric.

Once the sample impressions dried, color photographs were taken to illustrate the condition of the impression prior to treatment. Next, infrared photographs were taken to obtain an enhanced impression of each footprint. Fabric samples were then processed with the DAB treatment. The DAB treatment required mixing 4 solutions. Solution A, the fixer, was prepared by adding 1000 mL of distilled water to 20.0 g of 5-sulfosalicylic acid. Solution B, the buffer, was prepared by mixing 100 mL of 1M phosphate buffer solution (pH 7.4) to 800 mL of distilled water. Solution C, DAB, was prepared by adding 100 mL of distilled water to 1.0 g of 3, 3'-diaminobenzidine tetrahydrochloride. Solution D, the DAB developer solution, is prepared by mixing 180 mL of solution B, 20 mL of solution C to 1 mL of 30% hydrogen peroxide.

The bloodstained samples photographed with infrared photography produced 9 (30%) superior enhanced impressions. No impressions were enhanced on the 100% cotton fabrics, 6 (20%) were enhanced on 100% polyester, and 3 (10%) were enhanced on the fabric blends.

When the DAB treatment was applied to the bloodstained samples, 21 (70.0%) were enhanced. Ten (33.3%) were on 100% cotton, 4 (13.3%) on 100% polyester, and 7 (23.3%) on fabric blends.

In conclusion, DAB was more effective than infrared photography for enhancing bloodstained impressions on the 30 fabrics tested. On the 100% cotton samples, the DAB treatment produced more superior images than infrared photography. Infrared produced more superior images on 100% polyester and fabric blends than DAB produced. It is important, however, to note that investigators should exercise caution when applying the DAB treatment because diaminobenzidine is a hazardous chemical.

Bloodstained Footwear Impressions, Infrared Images, Diaminobenzidine (DAB)

85 A Profile of Non-Natural Deaths in the Area of Transkei South Africa

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Background: Each year non-natural (injuries) deaths account for more than five million globally. Traffic collisions, falls, drowning, burns, and deliberate acts of violence against oneself and others are among the causes of these injuries. The poor are at high risk for non-natural deaths because they faced with hazardous situations on a daily basis. The poor also have less chance of survival when injured because they have less access to health services (WHO, 2001).

Objective: To assess non-natural deaths and their causes, in Mthatha area.

Method: This is a retrospective review from the data collected at Mthatha Hospital Mortuary between 1996 and 2005. The age, gender, occupation and the cause of death have been recorded. Using SPSS statistical program, data were analyzed.

Results: There were 9304 non-natural deaths referred to the mortuary for autopsies between 1996 and 2005. The mean age of subjects was 32.7 years. The mean age of male victims was 32.2 years while in females, 34.9 years and this difference was statistically significant ($P < 0.001$). The mean age of women was more than in males in most categories of causes of death except in poisoning, drowning, and collapse. Majority (78.8%) of victims were male. Of this 2064 (23.3%) were between 21 and 30 years of age group.

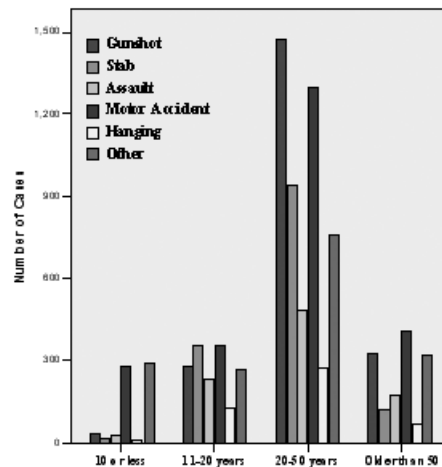


Figure 1. Distribution of causes of deaths among age groups (1996-2005)

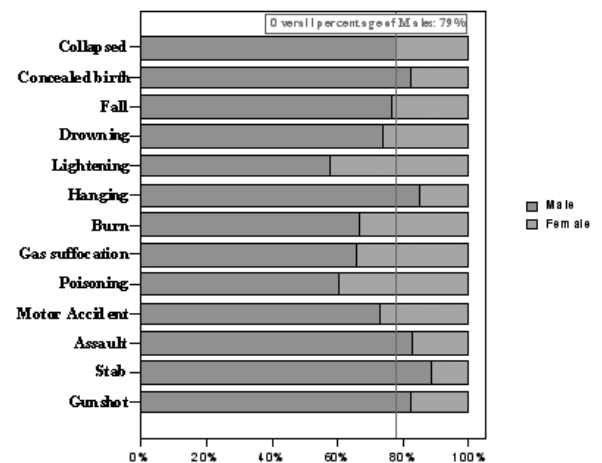


Figure 1. Distribution of gender among causes of death

There were 7049 (75.8%) traumatic deaths. Of this 4647 (49.9%) were homicides. Road Traffic Collisions (RTC) 2402(25.8%) was the most common traumatic cause of death followed by those due to firearm injuries 2159(23.2%), stab wounds 1489(16%) and blunt trauma 999(10.7%).

In the ages younger than 10 years and older than 50 years RTCs was the most common cause of death. On the other hand in the 11-20 year age group, the most common cause of death was stab wounds. Firearm injuries were common in 20-50 years age group. There were 2255 (24.2%) non-traumatic deaths. They are poisoning 203 (2.2%), gas suffocation 64 (0.7%), burns 184 (2%), hanging 484(5.2%), lightning strike 157(1.7%), drowning 401(4.3%), falls 140(1.5%), concealed birth 34 (0.4%), collapse 482 (5.2%), and decomposed bodies 106 (1.1%).

Firearm injuries (OR: 2.54-3.62,) and stab wounds (OR: 1.71-2.49) were more common among adults than children, and the difference was statistical significant ($p < 0.001$). Road traffic collisions (OR: 0.57-0.72), gas suffocation (OR: 0.19-0.54), burns (OR: 0.36-0.70), lightning strike (OR: 0.34-0.72) collapse (OR: 1.39-2.69) and drowning (OR: 0.14-0.22) were less common in adults than in children, and the difference is also statistically significant ($p < 0.001$).

Conclusion: Non-natural traumatic deaths are higher among males in the younger age groups.

Non-Natural, Traumatic Death, Non-Traumatic

59 Bodies in Parcels

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Suspicious methods of body disposal almost always point out to a criminal manner of death. The discovery of an adult body in a parcel; whether thrown in a rubbish dumpster, submerged in water, burned by fire, thrown away in the desert or simply left out in an alleyway, is a strong indication of homicide.

Ten of such parcels have been investigated by the authors. The bodies found in the parcels had either been intact and complete, dismembered but complete or dismembered and incomplete. The parcels ranged from suitcases, sacs, metal trunks, and cardboard boxes. This series did not include cases of infanticide where bodies of illegitimate newly born infants were occasionally found dumped in various forms of parcels.

The cause of death ranged from strangulation, stabbing, smothering and blunt trauma to the head.

Crime Scene Investigation and Police Science

In only one case of the series had the death not been homicidal, but had nevertheless involved a criminal circumstance. It was a corpse of a body packer who had swallowed about 25 capsules of pure heroin and died accidentally due to leakage of the substance inside his alimentary tract.

Each of the ten cases will be briefly presented and discussed. Photographs from the scene and from the autopsy room will be displayed and explained.

Bodies in Parcels, Suspicious Body Disposal, Homicides in Dubai

49 A Case Study of Racehorse Sample Matching Using a Novel 24-plex STR Typing System

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Illegal use of drugs is prohibited in racehorses, and thus, doping control is necessary to monitor compliance. Short tandem repeat (STR; microsatellite), as DNA marker is used in genotyping to resolve authenticity of sample and donor. We previously developed a novel 24-plex STR typing system to identify the origin of a sample and determine possible contamination by human DNA. Following intelligence received a barn search was conducted during which time one syringe and two needles with blood stains were collected and sent to the laboratory along with one blood sample from a suspect racehorse for DNA evidence. Bloodstains in the syringe and needles were thoroughly suspended in TE buffer and DNA was isolated using PureGene DNA Purification System. Total quantity of DNA isolates was 0.112 μ g for the syringe bloodstain and 0.3 μ g for one of the needle bloodstains but no detectable DNA was obtained from the second needle bloodstains. A 24-plex STR analysis was performed on TC512 Thermocycler and CEQ8800 Genetic Analysis System. The results indicated that the syringe and the needle bloodstains possess identical genotype and that both correctly matched the blood sample collected from a known racehorse in the barn, indicating that the blood in both samples came from the same donor. The second needle sample generated a partial DNA profile because of insufficient material and, therefore, conclusive evidence could not be drawn as to the donor. None of the samples was contaminated with human DNA.

Racehorse, Case Study, DNA Profiling

560 Investigation Into a Screening Method for Trace DNA Detection at the Crime Scene

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Trace DNA (less than one hundred picograms of DNA) has become more commonly collected at crime scenes and submitted for analysis. However, sampling is mostly achieved in a blind manner, although based on common sense and on the context of the case. It would be desirable to identify a reagent (amino acid stains, histological stains, or reagents used to quantify DNA during profiling) or a lighting system that could visualize areas where DNA is present, even at very low concentrations.

In this study, five reagents and filtered light illumination were chosen, based on low toxicity, availability of the reagent and techniques and their potential to visualize low levels of DNA. These were subsequently tested for sensitivity using serial dilutions of buffy coat cells on porous and non-porous surfaces. Real-time PCR was used to quantify the amount of DNA present which was indicative of the damage that the reagent had caused to the quantity of DNA.

Powdering and forensic lighting systems had very high sensitivity and low specificity; while reagents such as fluorescamine and DAPI, had low sensitivity but high specificity. The DNA testing did not indicate that any reagent was particularly damaging to DNA.

Overall, it is recommended that a light source such as a Polilight® or Crime-lites® is initially used to identify areas of DNA on all surfaces, followed by fingerprint powdering on non-porous surfaces and ninhydrin spraying on porous surfaces. Fingerprint detection techniques may help to simultaneously indirectly identify DNA-rich areas, as well as developing fingerprints.

Crime Scene, Trace DNA, Detection

20 Exclusion of Syringe/Needle Blood Samples From Racehorse Sample Matching By Detection of Microsatellite Loci

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DNA identification is an integrated component of forensic testing in the racehorse industry. The use of microsatellite loci and short tandem repeats (STR) makes it possible to identify the sample's origin. We previously developed a novel 24-plex STR typing system to identify a racehorse and detect possible contamination by human fluids. Two syringes with needles attached were seized during a barn search and sent to the laboratory along with four control blood samples for DNA evidence. Bloodstains were extracted in a TE buffer solution and DNA was isolated from the samples using the PureGene DNA Purification System. The total DNA quantity was 0.25 µg for one stain and 0.5 µg for the second stain. A 24-plex STR typing was performed on a TC512 Gradient Thermocycler and CEQ8800 Genetic Analysis System. The DNA profile of 21 equine microsatellite loci obtained from one syringe did not show a match to the profile for any of the control blood samples. The STR profile obtained from the second syringe was limited and, therefore, could not be compared against the control blood samples. The blood in the syringe was excluded from the control blood samples. None of the samples tested positive for the presence of human DNA, indicating that all the samples were of equine origin.

Racehorse, DNA Profile, Casework

27 A Half Century Retrospective Study of Homicide-Suicide in Geneva - Switzerland: 1956 – 2005

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This study provides a retrospective review from the forensic files of the University Institute of Legal Medicine in Geneva, from January 1956 to December 2005. Spanning a period of half a century, each case presented represents a homicide followed by the suicide of the perpetrator. During the same 50 year period, a total of 228 homicides were perpetrated in Geneva. In 23 cases, the suicide of each aggressor followed the murder of 34 of the total 228 homicide victims. All victims were close to the perpetrators with either an intimate, parental, or filial link, including 18 women, 15 children, and one man. The suicidal perpetrators in these homicide-suicide events were most often men that killed their wife or intimate partner and even their children in some cases. The means most often used was shooting followed by a suicidal stabbing. The majority of the victims and perpetrators were of Swiss nationality. This retrospective study illustrates that in the last 50 years, the phenomenon of homicide followed by the suicide of the perpetrator, in the canton of Geneva, proved to be a rare and an episodic phenomenon with a very variable frequency from one year to the other.

Forensic Autopsy, Homicide-Suicide, Geneva

435 The Study of Chemical Methods in the Development of Dust Footprints

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There is no doubt that footprints are left at crime scenes. Investigation has shown that, dust footprints also have a high Frequency of appearance at crime scenes. It is important for investigators to pay attention to the development of dust footprints left behind by the criminal offender. Various chemical methods such as HSCN, K₃Fe(CN)₆ are used to develop dust footprints. Other factors in the development of dust footprints include the developing paper, and the wood qualities of the surface. The study reveals that painted wood floors and other non-porous surfaces improve the chances of developing dust footprints of higher quality.

Dust Footprint, Chemical Methods, Development

Crime Scene Investigation and Police Science

499 Violent Hanging: The Method is Noticeable

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Forensic death cases must be examined in detail. It is especially important to eliminate bias in determining the cause or origin of death. The aim of this study is to draw attention to the murder method disguised as a suicidal hanging. One case involves the death of a 17 year old woman. The male partner of the victim reported the death as a suicidal hanging. The external physical examination of the body revealed strangulation marks and subconjunctival hemorrhage. Bleeding into the soft tissue of the neck was discovered during the internal examination. The toxicology examination revealed no sign of a toxic substance. During the crime scene investigation, hair was found in the knot of the strangulation device. The prosecutor had a suspicion and questioned the partner of woman again. The man said that they had had a discussion the night before and he encircled the strangulation device to her neck and tied a knot. Afterwards, the male partner placed the strangulation device over the door and held tightly until the victim's body was motionless.

Although the most frequent (90%) origin of hanging is suicidal forms of hanging include violent hanging by someone else or by way of an accident. The crime scene, external examination of the body, and autopsy findings support the case as suicidal hanging. But to find hair in the knot is unusual. Seemingly unimportant, the finding made it possible to determine the cause of death. The case reveals the importance of eliminating bias in determining the cause of death and to evaluate every case by standardized methods.

Hanging, Homicide, Crime Scene Investigation

573 The Research on Gender Analysis by Morphological Characteristics of Footprint

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Females sometimes commit or take part in the commission of crimes. As a result, accurate gender analysis of the suspect by the footprint left at the crime scene becomes very important for the investigation. However, the design fashion in footwear manufacturing industry, such as certain shoes suitable for both male and female, makes gender analysis of footprints quite difficult. The difference between feet the differences between the shoes of males and females, the differences between footprints were discussed in this paper with regard to the anatomical structure, athletic ability, habitual action, footwear fashion and the shoe wearing habit of males and females. Foot length, width, heel breadth and hallux valgus angles of bare footprints were chosen and measured. Large amounts of data were obtained and calculated with Microsoft Excel to analyze the features and rules of footprint morphology. The T-test was used in significance analysis of differences between morphological characteristic ratios of male and female footprints.

It was concluded that differences in the morphological characteristics between male and female footprint exist, with foot length, foot width, and heel breadth of males being longer than those of female. The ratio of foot length to foot width, the ratio of foot length to heel breadth, and the ratio of foot width to heel breadth were significantly different between males and females and thus could be utilized as the basis of gender analysis of footprints. The hallux valgus angles of bare footprints were also found to be valuable in gender analysis.

Foot Morphology, Gender, T Test

161 Combating Child Sexual Exploitation in Colombia - Presentation of an Investigator and Crime Scene Analyst's Manual - Guideline

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This presentation will show how child sexual exploitation and child sexual trade "Gangs" operate in Bogotá, Colombia.

A case of dismantling and prosecution of pimps and child sexual abusers organizations will be presented. The "modus operandi" of these criminals will be described, including victims' psychosocial profile, location, and conditions in which these sexual activities take place.

The audience will receive information on the investigative progress obtained and the forensic evidence collected, as well as on the testimony of five 11 to 13-year-old victims.

The lack of information and training in this area forced Colombian investigators and forensic scientists to develop tools to effectively combat this atrocious crime. The development of the "Manual-Guideline" addressed to investigators and crime scene analysts were part of this effort. This valuable educational tool will be summarized during this presentation.

Child Sexual Exploitation, Child Sexual Trade, Criminal Investigation

375 Self-Reported Female Consumers of Internet Child Pornography: A Psychological Analysis

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As society becomes more dependent on technologies such as the Internet, the risk of online deviant behavior also rises. With the development of the Internet, the amount of child pornography produced and its availability have increased, along with the efficiency of its distribution, and its accessibility by other child pornography users (Wortley & Smallbone, 2006). Research suggests that the child pornography industry generates approximately three billion dollars annually, and there are roughly 100,000 websites offering illegal child pornography (Ropelato, 2006). In addition, according to The National Incident-Based Reporting System (NIBRS) for the Department of Justice, child and juvenile involvement as participants in pornography has increased from 15 percent in 1997 to 26 percent in 2000 (Finkelhor & Ormrod, 2004).

Limited research has been conducted on the differences between those individuals who view, download, share, or create online pornography from those who do not. Even fewer studies have attempted to identify and understand the personality characteristics of female consumers of Internet child pornography. A recent study analyzed the personality characteristics of self-reported child pornography users via an online survey, and identified 5.5% of the study's sample as female child pornography consumers (Seigfried, Lovely, & Rogers, 2007). This was a surprising statistic since the crime of child pornography has clearly been considered to be mostly a male phenomenon, which warranted further analysis of the personality characteristics of these female users of Internet child pornography.

In the current study, 162 female respondents of an online survey were analyzed; ten (6.2%) were classified as child pornography users and 152 (93.8%) were classified as non-users of Internet child pornography. A backward stepwise (Wald) logistic regression identified a predictive model for female child pornography users with the following variables: neuroticism, moral choice hedonism trait, and race. Further implications and limitations are discussed along with suggestions for future research in the area of Internet child pornography consumption.

Child Pornography, Personality, Female Users

670 Deciphering Who Killed the Prostitute Utilizing Keppel and Walter's Revised Classification Model for Understanding Sexual Murder

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In the fall of 2007, through the guidance of the Henry C. Lee Institute of Forensic Science, located at the University of New Haven, a process was started whereby teams of hand picked Forensic Science graduate students were selected to review and evaluate unresolved homicides from local police departments.

One case in particular was a ten-year-old investigation that involved the murder of a prostitute who was strangled and posed nude in a sexually suggestive position at the end of a fairly secluded dead-end road where it was common knowledge that uniformed police officers would park to write reports, drink coffee, etc. Five years after her death a suspect was arrested for the murder of a prostitute in a nearby town. This prompted the primary agency to investigate this person for the murder. During this effort they determined during

Criminal Profiling

that five year period there were two other prostitute murders, one being out of state but within 50 miles. This common factor caused the lead agency to concentrate on the convicted murderer as they believed him to be a serial killer of prostitutes.

The evaluation process of the investigation conducted by the students consisted of making determinations as to victimology, timelines, evidentiary issues, relationship studies, pros and cons as to the persons of interest, interrogation strategies and a detailed investigative plan. It also included a comparison of the victims, suspects and characteristics of all four crime scenes utilizing Keppel and Walter's revised classification model as described in their article Profiling Killers: A Revised Classification Model for Understanding Sexual Murder (The International Journal of Offender Therapy and Comparative Criminology, 43(4),417-437, 1999.)

In the opinion of this author, the Keppel and Walter classification model clearly shifts the primary person of interest from the incarcerated killer to another person. Like many perpetrators this person not only appears in the case file numerous times, but showed up at the remote crime scene without any bona-fide reason for being there. However, he was eliminated due to no physical evidence tying him to the murder without any consideration for the behavioral issues as outlined by Keppel and Walter.

Criminal Profiling, Cold Cases, Criminal Investigation

515 Comparison and Classification of the Seized Drugs in Cukurova Region in 2007

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Drug smuggling has been a threat to the economical and social structures in our country. The Cukurova region, due to its location, is the Turkish gateway to the Mediterranean because it has many openings to the Middle East. In this study, we aimed to identify the types and amounts drugs seized in this region. The physical condition and ingredients of the seized drugs were also analyzed. The data for this study was collected from the 983 cases sent to the region's main laboratory, Chemical Analysis Department of the Council of Forensic Medicine, Adana Group Chairmanship in 2007, and analyzed via cluster analysis.

With a 77.11 submission percentage, cannabis was found to be the most frequently seized drug sent to this laboratory. Following cannabis was amphetamine by a percentage of 8.45, hashish with a percentage of 5.59, heroine with a percentage of 5.59, cocaine with a percentage of 0.41 and miscellaneous drugs with a percentage of 2.85 in 2007.

The research has proven that the region is on the natural path of drug smuggling. Cannabis is easily grown in the region due to the climatic conditions. Among the reasons cannabis is seized in greater amounts than the other drugs are the lower cost and more suitable growing conditions. To prevent the negative social and economical effects of drug growth, trade, transportation, and use, several precautions should be taken, which include tightened security and healthy educational policies supported by the participation of non-governmental organizations.

Cukurova Region, Seized Drugs, Narcotics

117 The Development and Evaluation of Radiological Decontamination Procedures for Forensic Evidence

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Terrorist organizations and radiological materials have recently been linked together and are in the forefront of counter terrorism strategies worldwide. The detonation of a radiological dispersion device (dirty bomb) by a terrorist cell would warrant a criminal investigation, with the forensic examination leading this process. This could involve the collection, transportation and analysis of radiological contaminated trace evidence. But are law enforcement agencies and forensic scientists capable of dealing with this?

In general, traditional forensic laboratories are not able to receive and analyze radiological contaminated evidence, because they do not have the appropriate instruments and equipment to contain the radioactive contamination and perform the forensic procedures safely. On the other hand nuclear and radiological facilities (e.g. ANSTO in Australia) are able to accept this type of evidence, however often they do not have the forensic instrumentation nor the forensic expertise to do the appropriate analyses. A solution to this problem would be to have a forensic facility in a nuclear complex which is capable of doing all the necessary analyses. However, with Australia and many other countries not having these facilities, procedures need to be in place so that the radiological contamination can be removed from the evidence or lowered to safe levels prior to it entering a forensic laboratory.

Decontamination procedures for radiological contaminated forensic evidence have not been developed or studied. Numerous decontamination products and technologies are available on the market; however these are usually tested and used during the decommissioning and decontamination of hard, non-fragile surfaces in nuclear facilities. Forensic evidence however is usually found in trace amounts and is very fragile in nature. Any procedure that destroys or alters the evidence in any way will have a dramatic effect on the forensic investigation, and thus the prosecution of the criminals involved. This work has developed non-destructive, chemical decontamination methods for the removal of radiological contamination (Cs-137, Sr-85, and U3O8) from various forms of evidence (fibers, hairs, DNA, documents and surfaces containing latent fingerprints). The effects that the procedures have on the different types of evidence and their forensic interpretation are also reported.

Radiological Forensics, Counter Terrorism, Radiological Decontamination

148 The Effects of Ionizing Radiation Exposure on the Forensic Assessment of Critical Trace Evidence

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In the event of a malevolent release of radioactivity and radiation exposure by means of a radiological dispersion device (RDD), a comprehensive and timely investigation is warranted. The characteristics of radioactive materials and their potential for radiation exposure to the first responders and crime scene examiners can result in a protracted and untried forensic investigation. The problematic nature of forensically processing a radiologically contaminated crime scene was highlighted in a recent incident in the United Kingdom, involving the radioactive isotope, polonium-210 in the demise of a Russian expatriate.

British authorities required considerable effort and resources to forensically process several contaminated residences (including hotel rooms) and subsequently handling and storing the contaminated evidence as to mitigate the spread and therefore the hazardous effects of radioactive materials.

Although engineered solutions readily overcome handling, forensic processing and storage issues there has been very limited research evaluating the overall impact of radiation exposure on forensic trace evidence.

In this study, we investigate the effects of ionizing radiation on critical trace evidence. In particular, a diverse selection of head hair, natural and synthetic fibers, glass fragments, document inks and DNA were exposed to increasing doses of radiation (1 to 1,000 kGy). These doses are intended to simulate different exposure scenarios for commonly used radioactive sources, including Cobalt-60, Cesium-137, and Iridium-192. At each dose level, the trace items were evaluated using a range of commonly used forensic techniques to ascertain if a) any radiation damage has manifested and b) whether or not the radiation damage has an impact on the quality of the forensic interpretation and methodology.

Trace Evidence, CBRN Crime Scenes, Nuclear Forensics

156 A New Statistical Method to Assess the Number of Fibers Transferred by a Textile on Car Seats

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The transfer of fibers during criminal action is very common. However, fiber transfer is a very complex phenomenon. Many authors studied fiber transfer mechanisms but no model has been created to predict the number of fibers transferred in a given situation. Actually it is still necessary to simulate real contacts in order to know the number of fiber transferred in a given situation. This procedure is difficult and time consuming.

The main purpose of this research is to create a model to predict the number of fibers transferred during real contacts based on a few parameters of the donor textile. The study is limited to the action of driving a car and 36 knitted wool and acrylic pullovers. Several characteristics of the donor textiles were considered and statistical tools were used to assess their relative importance concerning the number of fibers transferred.

Two parameters of the donor textiles were found to be important: the shedding capacity of the textile surfaces and the length of the fibers. The shedding capacity is a parameter which estimates the quantity of fibers that are not or slightly attached to the structure of the textile. These fibers are easily transferred during a contact. The length of the fibers is also an important parameter. If the fibers are short, they are more easily transferred.

This survey shows that it is possible to predict the number of fibers transferred on a car seat by an acrylic or wool pullover given only two parameters of the donor textile: the shedding capacity and the fiber length. This approach is totally innovative and will considerably simplify the work of fiber experts.

Fibers, Transfer, Interpretation

243 Spectral Analysis of Metameric Blue Fibers and Their Forensic Significance

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Metamerism is a phenomenon where two or more colored items with different colorant chemistries appear to the observer to have the same color. There are several different types of metamerism with illuminant and observer metamerism being the most common. If a change in lighting conditions results in the items appearing to have different colors, this is illuminant metamerism. If the items appear to have different colors to separate observers, this phenomenon is called observer metamerism.

In forensic science, the concern is whether or not metameric samples can be differentiated through their UV-visible spectra. Because different coloring agents and relative concentrations of those coloring agents are used, the UV-visible spectra of the items should be different. Additionally, the literature on color science suggests that metameric samples will have spectra that intersect at three or more loci. However, few documented results exist to demonstrate the differences in the spectra nor is there confirmation that the spectra do indeed intersect at three or more loci. Additionally, what is the variation in the spectral response of metameric samples created using the same coloring agents, but in different proportions? There is very little documentation regarding these scenarios in forensic literature. In order to rectify this situation, UV-visible microspectra were obtained from several fiber samples made with different textiles and colorant combinations. This study was undertaken in order to help fill the void on these topics in forensic literature.

Metamerism, Trace Evidence, Microspectroscopy

280 Trace Element Analysis Using X-Ray Fluorescence Microscope

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The goal of this study was to investigate the utility of X-ray Fluorescence (XRF) microscope in determination of trace elements concentration and distribution in Gun Shot Residue, Antiques, Museum objects, and Counterfeit Products. The advent of XRF microscope for laboratory use presents new applications for the forensic scientists.

Micro-XRF technology is a relatively recent introduction to the field of art conservation, archeology, boarder security, trace analysis and forensic science. XRF analysis gives a rapid, non-destructive reading of the elemental composition of any material for elements starting from Na till U in the periodic table. Horiba XGT-7000 XRF analytical microscope was used in this study. This desktop unit utilizes a portable 50W X-ray source for excitation, two switchable (as small as 10 microns) monochapillary for different special resolution, and capability to work in vacuum and in ambient condition.

Several examples of using micro XRF will be shown for:

1. Analysis of Gun Shot Residue (GSR) – to include presentation of chemical and micro transmission images, and comparison of chemical images with fluorescence images
 2. Fingerprints chemical images
 3. Chemical images of original and counterfeit devices
 4. Mapping of museum and archeological objects
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XRF, Analysis, Trace Elements

550 Application of Cathodoluminescence Microspectrophotometry for the Forensic Comparison of Concrete Samples

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Concrete is the most ubiquitous man-made material on the planet and is typically comprised of a Portland cement plus some aggregate materials such as rocks, sand, slag, or ash. Its extensive use as a building material means that pieces of concrete may become objects of interest during routine forensic examinations. Concretes are a complex mixture of materials that vary widely in manufacture, which makes it difficult to arrive at a universal characterization method that would uniquely identify the source of concretes. However, the manufacture of concrete and in particular cement is very well studied and microscopical examinations of cements are standard evaluative tools used by the manufacturing industry. When combined with a well-known microscopical technique of cathodoluminescence, which has been used extensively by geologists, it is possible to design a method to classify and categorize concretes that would be useful in forensic provenance determinations.

Cathodoluminescence (CL) is the emission of visible or near visible light from a sample that has been bombarded by an electron beam. CL results from the alteration of band-gap energies due to the presence of trace elements or structural defects in crystalline materials such as minerals. The CL emission is characteristic of either the geological environment of formation of the mineral or, for a synthetic luminescent material, the manufacturing process. CL is observed in many materials routinely encountered as trace evidence, including soils and rocks, building materials, glass, pigments, and filler/extenders. The variation in luminescence for a particular mineral can therefore be used to discriminate among samples from different sources or, in certain cases, provide information about the provenance of a sample. When combined with reflected visible light microscopy from the surface of a concrete sample, visible distinctions between apparently similar concretes are possible. These distinctions can lie in the cement portion of the concrete, some of the chemical admixtures add to the concrete, or in the aggregate materials used. Simple color, size, and morphology of the constituents in visible light and under CL can be used to create categories of concrete useful for forensic examination. It is possible that specific colors of concrete constituents will not only provide enough discrimination for rudimentary provenance studies, but that they will accurately describe the environmental exposure and curing properties of the cement being used.

This presentation will provide an introduction to the principles and practice of CL with a specific focus on its use to obtain visual information that can be used to discriminate between concrete samples. The details of a method of image processing and subsequent analysis will be explained based on color and compared to high-resolution spectroscopic studies of the same minerals found in concretes. The applicability and limitations of CL in cases of comparison, authentication, and geographic sourcing will be discussed.

Concrete, Cathodoluminescence, Provenance

397 What is the Occurrence of Petrol Traces in Car Boots? - An Australian Survey

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When petrol is detected within a motor vehicle, a question often arises, could the petrol could have been inside the motor vehicle accidentally/innocently. This study was carried out to determine if petrol could be detected on carpet in the boot of vehicles selected at random within a population. The study also looked at variations between different locations within a single vehicle.

Samples of carpet were taken from the boots of one hundred vehicles, and extracted using a passive headspace technique. The samples were analyzed using GC/MS to identify any chemicals collected by the sampling and the results classified according to the presence or absence of compounds required for the identification of petrol according to ASTM methods E1618 and E1387. For the second part of the study, samples were collected from four different locations within the boot of twenty vehicles.

The first part of the study found petrol in the boot of one vehicle out of a hundred vehicles tested. Further, four vehicles showed some compounds consistent with petrol, but the resulting profiles were insufficient to make a positive identification. In the second part of the study, petrol was found in one sample from one vehicle. Two other samples from that vehicle contained target compounds, but not a full petrol profile. Two other vehicles contained target compounds without displaying a full chromatographic profile for petrol.

Fire Accelerants, Interpretation, Survey

556 The Detection of Organic Explosives Using Lab-on-a-Chip Technology

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Lab-on-a-chip (LOC) devices miniaturize and integrate multiple sample handling steps together with both separation and detection of analytes. LOC instruments offer numerous advantages including reduced analysis time, minimal reagent consumption and of particular significance, the potential for portability. Commercially available LOC instruments such as the Agilent 2100 Bioanalyser were designed for life science applications, but the instrument may also be used for the detection of explosives.

This presentation details the separation and analysis of important organic explosives employing the Agilent 2100 Bioanalyser. The explosives were separated by micellar electrokinetic chromatography with detection by fluorescence quenching. The analysis time is around 45 seconds with sub ppm detection limits. Research is currently in progress to further miniaturize the instrument to a hand-held device and improve its analytical capabilities. This instrument will be lightweight; battery operated and applicable to on-site detection of organic explosives.

Lab-on-a-Chip, Explosives, Micro Fluidics

629 Identification of Synthetic Fibers Using Hotstage Microscopy and Eutectic Melting Point With P-Nitrophenol

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The identification of synthetic fibers based on their melting points has been explored before. However, traditional hotstage microscopy methods exhibit two problems when used for synthetic fiber identification: the melting points tend to occur non-reproducibly over a wide range in temperature, and many synthetic fibers decompose before a melting point was reached. A procedure published in 1956 by Donald G. Grabar and Rita Haessly mitigated these issues and used p-nitrophenol as a reference compound to obtain a eutectic melting temperature with synthetic fibers. This presentation will revisit their technique and expand on the number of fibers examined, including modern fibers as well as the high-performance fibers.

Fibers, Fusion Methods, Polarized Light Microscopy

47 The Application of an Activated Carbon Membrane for Analysis of Ignitable Liquid Residues

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A new type of activated carbon membrane was prepared by using polyacrylonitrile fibers. Its adsorption capacity towards n-heptane was 40 $\mu\text{L g}^{-1}$. Adsorbed n-heptane on the membrane was 20% desorbed under 100 $^{\circ}\text{C}$ in 30 min, and completely desorbed under 180 $^{\circ}\text{C}$. No significant decrease in adsorbed n-heptane on the membrane was observed during long-term (150 days) storage. The application of the membrane for recovery of some popular arson ignitable liquid such as gasoline, diesel, jet kerosene and paint thinner, as well as their residues was studied on a laboratory recovery unit. About 75% n-heptane spiked in the soil could be recovered within 30 min under 100 $^{\circ}\text{C}$. High temperature and vacuum conditions were beneficial to recovering fire ignitable liquid residues and debris from spiked soils. With the membrane and recovery method, the gasoline, diesel, and paint thinner in the soil were satisfactorily recovered and were then separated and analyzed on GC-FID. The gasoline, diesel, jet kerosene and paint thinner spiked in the carpet and cotton, were recovered together with their residues by using this membrane, and were analyzed on GC/MS.

Activated Carbon Membrane, Ignitable Liquid Residues (ILR), GC-MS

398 Analysis of Emerging Explosive Mixtures and Explosive Precursors

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With the increasing use of hydrogen peroxide in the production of improvised explosive devices, policing agencies require methods to detect, quantify, store and handle any samples of hydrogen peroxide which may be collected. This study was performed with two key areas of interest. Firstly, this study aimed to compare different analytical methods for qualitative and quantitative analysis of hydrogen peroxide and to make judgments about which technique(s) are more suitable for use under field or laboratory conditions. Secondly, this study aimed to explore how storage conditions in a forensic laboratory may affect the concentration of hydrogen peroxide.

The study was based on commercial products easily available to the public. The list of products included a teeth-whitening mouthwash, an antiseptic solution available from chemists, a hair bleaching crème, and three spa sanitizers of varying concentration. The quantitative analysis methods performed included iodimetric titrations, potassium permanganate titrations, cerium sulphate field-test titrations, attenuated total reflectance (ATR) spectroscopy and Raman spectroscopy. The need for sensitive and selective qualitative tests for hydrogen peroxide was also explored, utilizing semi-quantitative peroxidase enzyme test strips and a titanium oxysulphate reagent, as well as a hand-held Raman system.

In this study it was found that the iodimetric titration was the most precise laboratory technique. Cerium sulphate titration was the best portable quantification procedure for peroxide concentrations greater than 2 g/100 mL. In regards to vibrational spectroscopy, Raman provided superior results to ATR as the water in the aqueous solutions was not an interference. Both the enzyme test strips and titanium oxysulphate reagent proved to be promising screening techniques with minor semi-quantitative capabilities. The portable Raman system also provided rapid screening for peroxide in aqueous solutions. The storage experiments showed no difference between samples stored at room temperature and samples stored at 4C over a period of eight weeks.

Explosives, Hydrogen Peroxide, Field-Tests

557 Analysis of Organic Explosives Via Rapid Resolution Liquid Chromatography Triple Quadrupole Mass Spectrometry

Alison Beavis, BSc, Jessica Booth, BSc, Tessa Barrett, BSc, Claude P. Roux, PhD, and Philip Doble, PhD, Centre for Forensic Science, University of Technology, Sydney, PO Box 123, Broadway, NSW 2007, Australia*

A rapid resolution LC method was developed for the baseline separation of 11 organic explosives, namely: HMX, RDX, 1,3-dinitrobenzene, 1,3,5-trinitrobenzene, tetryl, 2,4,6-trinitrotoluene, 3,4-dinitrotoluene, 2-nitrotoluene, 3-nitrotoluene, 4-nitrotoluene, and PETN. This 2.5 minute separation was achieved with an Agilent™ 1200 series rapid resolution HPLC system, utilizing a Zorbax SB-C18 column (50 x 2.1mm ID, 1.8mm particles). The water/methanol gradient mobile phase required a column temperature of 85oC and a flow rate of 1.3mL/min. The small dimensions of the column facilitated both rapid analysis times, and the use of small sample sizes. This was highly desirable as the intended application involved the analysis of post-blast residues, in which explosives are often present at very low concentrations.

The separation was monitored using both UV detection and a triple quadrupole mass spectrometer (QqQ-MS). The Agilent 6410 QqQ-MS was capable of operation in both electrospray and atmospheric pressure chemical ionization modes. This multimode ion source allowed simultaneous detection of nitroaromatic, nitramine and nitrate esters. A variety of additives were trialed to assess their viability to form characteristic adducts, with ammonium chloride identified as the most suitable. The sensitivity and selectivity offered by the QqQ-MS detector was superior to conventional UV detection with a significant reduction in the sample clean up time.

Liquid Chromatography, Mass Spectrometry, Explosives

502 An Overview of the Construction, Chemical Nature, and Laboratory Analysis of Chemical Reaction Bombs

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Chemical reaction bombs are destructive devices that can be manufactured from readily available materials. The primary mechanism of these devices entails an expanding vapor explosion that is usually induced by confining a gas-producing compound or mixture in an airtight container such as an ordinary soda bottle. Due to readily available information on the Internet, crime laboratories have seen a dramatic increase in the submission of such devices. Although seemingly benign, they are very dangerous devices that can result in serious personal injury and damage to property. Whether they are known as pop bombs, bottle bombs, chlorine bombs, etc., the effect is still the same; forceful explosions accompanied by the release and dispersal of dangerous gases and liquids.

During the course of this presentation, the general construction and mechanism of these devices will be discussed. Various examples will be presented to demonstrate the destructive nature of several types of chemical reaction bombs. Additionally, we will present a suggested protocol for the documentation and analysis of both intact ingredients and post blast residues. To this end, various analytical methods will be discussed including microscopy, wet chemical screening techniques, micro-chemical tests, micro-crystal tests, and instrumental analysis. In order to further demonstrate the applicability of various analytical techniques, data from known ingredients will be provided.

Chemical Reaction Bombs, Low Explosives, Post Blast Residue

606 Urea Nitrate: A Powerful Explosive That is Easier to Make Than Frying an Egg

Joseph Almog, MSc, PhD, The Hebrew University of Jerusalem, Casali Institute of Applied Chemistry, The Hebrew University, Jerusalem, 91904, Israel*

Urea Nitrate (uronium nitrate, UN) is a powerful, home-made explosive that can be easily made from urea and nitric acid. We found that concentrated nitric acid is not essential for the production and dilute nitric acid also forms UN. A colorless, crystalline substance is obtained that looks very much like sugar.

A sensitive and specific color test for UN was recently developed and the colored product has been fully characterized by analytical techniques including x-ray crystallography.

It is quite hard to identify urea nitrate from post blast traces, since in the presence of water it readily decomposes to its ingredients. An analytical technique, which was recently suggested by our group, involves extraction, column clean-up and LC/MS. It was found to be quite sensitive, but not fully specific. We have found three other combinations that may produce identical adduct ions. Attempts to increase the specificity of the analysis are based on formation of host-guest pairs of urea nitrate with crown ethers or with calixarenes, followed by LC/MS and crystallographic characterization. Collection experiments of debris from controlled explosions of urea nitrate and their analyses are underway.

Urea, Urea Nitrate, Improvised Explosives

705 Blood on Black - Using Polarized Light to Enhance Bloodstains on Dark Surfaces

Rebecca Bucht, Peter R. De Forest, DCrim, Frani Kammerman, and Brooke Weinger, John Jay College of Criminal Justice/CUNY, 445 West 59th Street, New York, NY 10019*

This presentation will introduce an improved method of photographing dark, bloodstained substrates without the use of chemical enhancement techniques, specialized film needs or digital imaging operations.

Accurately visualizing and documenting bloodstains and patterns is an integral part of crime scene processing and provide crucial information for both the analysis of evidence in the laboratory and crime scene reconstruction efforts.

During the course of examining evidence in cases, we did some exploratory work using polarizing filters over the light source and the camera lens and observed stunningly dramatic improvement in the contrast between the otherwise subtle bloodstains and the dark or black background.

NIJ funding was granted for research into the optimum conditions and limits for this polarized light photography of bloodstains. This presentation will showcase the results of that project.

Accurately visualizing and documenting bloodstains and patterns is an integral part of crime scene processing and can provide crucial information for both the analysis of evidence in the laboratory and crime scene reconstruction efforts.

Visualization of bloodstains is trivial for bloodstains on white or lightly colored surfaces. However, on darkly colored or black surfaces, this visualization can be extremely difficult. The failure to visualize and thereby recognize blood and bloodstain patterns on darkly colored surfaces has had seriously adverse consequences for important criminal investigations.

There are two aspects to the problem. First, the presence of blood may not be recognized at critical stages in the investigation. Second, where the presence of blood is recognized, the pattern of blood-staining may not be appreciated. Sampling of bloodstains for DNA typing and other analyses must take place with knowledge of the bloodstain patterns. Otherwise important information may be destroyed. In a significant number of cases knowing how the bloodstains were formed is more important than knowing the biological source of the stains. In most cases the two types of information are complementary.

Photography represents a nondestructive method of documenting stains. Traditionally, black and white photography uses color filters to either lighten or darken a stain against the surrounding background to elucidate the forensic information contained on a difficult substrate. This technique, however, provides little benefit with bloodstains on very dark and reflective surfaces. Observing and documenting bloodstains on these surfaces is problematic due to the glare reflected off of the surface as well as the lack of contrast between the stain and substrate.

Previous studies have shown the usefulness of chemical enhancement techniques on bloodstain patterns, with the drawback of potentially compromising DNA analysis and altering the stains. Performing background corrections on digital images and the combination of digital photographs taken at two or three wavelengths have also been shown to lead to enhanced visualization of blood on some strong colored substrates.

During the course of examining evidence in cases, we have done some exploratory work using polarizing filters over the light source and the camera lens. We have observed stunningly dramatic improvement in the contrast between the otherwise subtle bloodstains and the dark or black background.

This presentation will introduce results from NIJ funded research into identifying the optimum conditions and limits for this polarized light photographic method.

Polarized Light, Bloodstain Visualization, Photography

722 Nanomanipulation Coupled to Nanospray Mass Spectrometry: Applications to Direct Cell Probing and Trace Fiber Analysis

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The authors will present the novel instrumentation of nanomanipulation coupled to nanospray mass spectrometry in order to probe trace analytes from fibers, as well as direct cellular probing. Nanomanipulation is ideal for these applications due to its translational resolution of 10-100nm, in lieu of the optical limit, making it ideal to couple to nanospray mass spectrometry, which only requires a minimum of 300nL and 300attograms of analyte. This technique increases analyte detection sensitivity, and lower the amount of sample required with minimal damage to the evidence. With this instrument researchers are able to directly probe and manipulate from an object (a cell, or fiber) using the nanospray tip, and then directly transfer the analyte to the mass spectrometer reducing the analyte preparation. This technique was demonstrated by probing histidine and caffeine from a single rayon fiber then analyzing the trace particles. The extraction of lipid bodies from cotton seeds for analysis of triacylglyceride content and distribution was also demonstrated. The instrument is multifunctional with applications to the forensic sciences including analysis of gunshot residue and document ink.

Trace Fiber, Nanomanipulation, Nanospray Mass Spectrometry

1 Unraveling the Pet-Food Mystery: An Overview of the Analyses of Adulterated Protein Concentrate and Pet Food

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The goal of this presentation is to present the forensic community with an overview of the analytical approaches used by the US Food and Drug Administration's (FDA) Forensic Chemistry Center (FCC) in cases involving pet illnesses and deaths which were linked to the consumption of pet foods containing adulterated protein concentrates.

This presentation highlights methodology used in cases involving reports of pet illnesses and deaths in the spring of 2007. The FCC received hundreds of pet food samples, as well as samples of the protein concentrates used in the pet food formulations. The FCC was asked to determine what, if anything, was present in the samples that could be making the animals sick.

The first samples that arrived at the FCC consisted of pet food directly linked to specific consumer complaints of pet deaths. Necropsy reports from these animals stated that the cause of deaths was kidney/renal failure. These samples were screened for the presence of potentially toxic compounds using several techniques. The samples tested positive for melamine and related compounds using direct analysis in real time ion trap/ion cyclotron resonance tandem mass spectrometry (DART Ion Trap/ICR MS/MS), as well as using gas chromatography with mass selective detection (GC-MSD). The questions then became: Why are these compounds present? Where did they come from? How much is present?

The melamine contamination was traced to the raw materials. The analytical focus then shifted to the wheat gluten and rice protein used in the pet food formulations. Further analysis determined that not only was melamine present, but cyanuric acid, ammelide, ammeline and other related compounds were present as well. These were all nitrogen-rich compounds present in the "protein concentrates". To isolate and further identify these foreign materials, the FCC evaluated the bulk protein concentrates using stereoscopic and polarized light microscopes, as well as infrared and Raman spectroscopes (SLM, PLM, PLM-IR, PLM-Raman). Contaminated wheat gluten samples were not microscopically consistent with control wheat gluten, but were consistent with wheat flour. Particles isolated from the wheat gluten were consistent with melamine or melamine cyanurate.

A GC-MS method was developed to screen for the presence of the four melamine analogs. All pet food samples, as well as protein concentrates, were analyzed using this method. Cyanuric acid, ammeline, ammelide and melamine were easily detectable above 10ppm. Protein concentrates estimated by GC-MS to be above 0.1% (w/w) for melamine or any of the analogs were subjected to assay using high performance liquid chromatography with ultraviolet detection (HPLC-UV). The HPLC method separated the four compounds with detection

limits of approximately 0.01% (w/w) for melamine, ammeline and ammelide, and 0.04% for cyanuric acid. Adulterated protein concentrate samples ranged from trace amounts to roughly 26% (w/w) total of the four analogs.

Products purported to be wheat gluten or rice protein were analyzed for starch content using enzyme hydrolysis and high pH anion exchange chromatography with pulsed amperometric detection (HPAEC-PAD). The uncontaminated wheat gluten samples contained approximately 5% (w/w) wheat starch, whereas the wheat starch content of the adulterated products ranged from approximately 20 – 40% (w/w). This was consistent with the microscopic findings that the bulk of the products were similar to wheat flour. In addition, enzyme-linked immunosorbent assay (ELISA) was used to determine the content of gliadin, a wheat glycoprotein, in the protein concentrate samples. All-purpose flour contains roughly 5% (w/w) gliadin, versus 30% (w/w) in standardized wheat gluten. Untainted wheat gluten samples tested in the same range as the standard, whereas the adulterated products tested lower, indirectly proportional to the melamine and analog content.

As a whole, FCC analyses showed gross contamination of the protein concentrates. Ultimately, researchers have demonstrated that the combination of melamine and cyanuric acid contributed to the acute renal failure in the animals.

Pet Deaths, Melamine, Cyanuric Acid

157 Analysis and Discrimination of Semi-Permanent Hair Dyes by UV-Visible Microspectrophotometry, Raman Spectroscopy, and Thin Layer Chromatography

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The loss of hair during the commission of crimes is very common. Equally common is the occurrence of dyed hair. Forensic analysis of hairs consists primarily of optical examinations and DNA testing. If unsatisfactory results are obtained with the two most common forms of analyses, one may consider the analysis of dyes.

The goal of this study is to find a suitable sequence of analysis for semi-permanent dyed hairs. During the study, the discriminating power of each technique will be assessed and the possibility of linking dyed hairs and specific dye brands and colour will also be evaluated.

Hairs from three different volunteers were dyed with a set of thirteen semi-permanent hair dyes. Colorants were then extracted and analysed by UV-visible microspectrophotometry, Raman infrared spectroscopy and thin layer chromatography (TLC).

This survey shows that a direct comparison between dyed hairs and a corresponding commercial dye is impossible because dyes undergo some modifications upon reacting with hair samples. In order to adequately compare the hairs, it is essential to dye reference hairs and compare the extract with the questioned sample. This survey also shows that the techniques used are appropriate to analyse semi-permanent hair dyes. The techniques also allow for a very good discrimination of dyed hairs. Furthermore, it was determined that the sensitivity of the chosen technique was dependent upon the length of the hair selected for analysis.

Semi-Permanent Hair Dyes, UV-Visible Microspectrophotometry, Thin Layer Chromatography

431 The Analysis of Lipsticks by FT-IR

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In numerous crime scenes, such as traffic accidents, rapes, robberies, homicides and invasions of privacy cases, lipstick evidence can be lifted frequently. Because of the frequent occurrence, the research of lipstick became an important task in forensic science. There are many methods currently being used for the analysis of lipstick including scanning electron microscopy/ energy dispersive spectroscopy (SEM-EDS), TLC, HPLC, UV - visible absorption spectrophotometry and pyrolysis gas chromatography. However, the analysis of lipstick by Fourier transform infrared spectrophotometry (FT-IR) is rarely performed. The goal of this presentation is to evaluate the reproducibility of the FT-IR method of lipstick analysis. Slightly over 200 lipstick samples were collected and analyzed using the Smart Performer. According to the IR spectra of the different absorption peaks, the lipstick samples were divided into two categories. It was determined that each category could be identified in accordance with the different absorption peaks. The experimental results showed that FT-IR was a simple, rapid, accurate and reliable method in the identification of lipsticks. The method was non-destructive and the results were reproducible. As a result, the study concluded that the FT-IR method of analysis is a reliable method for the analysis of lipstick from crime scenes.

FT-IR, Lipstick, Smart Performer Sampler

498 An Evaluation of UV-Microspectrophotometry for the Comparison of Automotive Clear Coats

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Automotive clear coats represent the front line during energetic transfers. Whether the contact is from car to car, person, or inanimate object, the clear coat (being the outermost layer) is often transferred either alone or in combination with other subsequent layers.

Although they are not as complex as underlying layers, such as colored base coats and primers, automotive clear coats contain a wealth of chemical information that can be utilized for their differentiation and comparison. The binders employed are often not very diverse, even when refinishing systems are considered. However, clear coats often contain UV absorbing compounds that may differ according to manufacturer, time of use, and availability. Additionally, by design, clear coats are meant to take on various aspects of weathering including UV radiation, damp environments, and resistance to solvents. Over the course of time, different automobiles and their accompanying paint systems will face different amounts of adverse conditions. This difference in conditions may affect the clear coats to the extent that differentiation may be more possible than originally thought.

The focus of this study was to examine the possibility for differentiating automotive clear coats through the use of Fourier transform infrared spectrophotometry (FTIR) and ultra violet microspectrophotometry (UV-MSP). Clear coats from a total of 89 samples from our in-house collection were surveyed and analyzed. The binders were classified and the UV spectra were compared. The results are quite surprising.

Automotive Paint, UV-Microspectrophotometry, Clear Coats

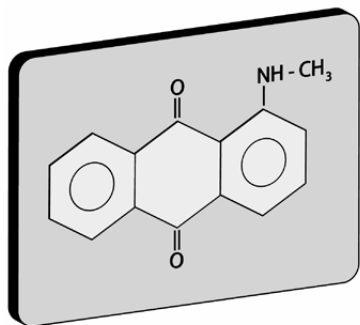
DNA Profiling and Serology

53 DNA-Marking of Security-Packs

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For quite some time, banks and cash transports have protected their cash holdings with Security-packs. However, the problem has been that found banknotes could not be assigned to a certain site of crime with sufficient certainty.

As a result, Security-packs are now being marked with DNA having a defined code. In this study, the dyes of stained banknotes were analyzed first and then the DNA was sequenced.



1-Methylaminoanthraquinone – MAAQ- is used as the dye in Security-packs.



Discoloration of a 50 € Banknote with MAAQ

Case 1: At a home searching in another investigation in the area of Düsseldorf, red stained banknotes were found. The dye was analyzed and then the DNA was sequenced. The banknotes could be assigned to a robbery which happened one year earlier.

Case 2: A man payed at a gas station with red stained banknotes. The discoloration was analyzed, followed by a sequencing of the DNA. The police arrested the person and the accomplice. When confronted with the results of the analysis, the two confessed.

Case 3: In amusement arcades in two different towns, someone payed with red stained banknotes. The analysis of the DNA applied to the banknotes corresponded with the banknotes taken during an earlier robbery. Video recordings showed that there was only one perpetrator. The alleged criminal had been found because he left a fingerprint on one banknote. He admitted during the police questioning to six additional robberies: four on banks and two on pharmacies.

DNA, MAAQ, Security-Packs

79 Biological Material Underneath Fingernails: What Else Is Obtained Besides the Owner's DNA?

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During the commission of a sexual assault, biological material can be transferred from the perpetrator to the victim or vice versa. One of the main locations where biological material can be found is underneath the fingernails. The fingernails or fingernail scrapings are collected from the victim and/or suspect during the medico-legal examination that is performed after the assault. DNA profiling of these samples reveals if any DNA is present, besides the DNA of the sample's owner.

The results of Second Generation Multiplex Plus (SGM+) DNA profiling of samples collected from fingernails or fingernail scrapings of victims and suspects in 15 sexual assault cases were reviewed. In total, 35 samples were subjected to DNA profiling. From these 35 samples, 34 DNA profiles were obtained. Of the 34 profiles obtained, 20 were complete DNA profiles, 11 were partial DNA profiles and three were mixtures. The DNA profiles were compared with DNA profiles from reference samples of the owner of the fingernails and other person involved in the case (if present).

Ninety-seven percent of the DNA profiles matched the DNA profile of the owner of the fingernails. In one case there was a match with the DNA profile of the suspect, although the sample was taken from the victim. The three DNA mixture profiles all matched the DNA profile of the owner of the fingernails. Evidently, foreign DNA was also found in these three samples.

In conclusion, DNA profiling of fingernails or fingernail scrapings was successful in 97% of the samples. In most cases a match was found with the DNA profile of the owner of the fingernails (97%). However, foreign DNA was found in 12% of the samples that did not match the DNA profile of the fingernails' owner. Therefore, DNA typing of samples from fingernails or fingernail scrapings can be of additional value in sexual assault cases.

Additional cases are being reviewed to obtain more data.

Sexual Assault, Fingernails, DNA Profiling

135 Elucidation of the Contributors for a Multiple-Source Splatter of Seminal Stains: A Calculated Approach

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The primary challenge in the DNA analysis of evidentiary seminal stains for gang-rape cases lies in the elucidation of the contributors from a splatter of seminal stains which are expected to be of multiple sources. The high cost of genotyping, the constraints on time and resources, and the wisdom to avoid mixtures warrants the use of a calculated approach. In this study, an approach was tested which hypothesizes that for a multiple-source splatter of seminal stains, small isolated semen spots (less than 1 cm diameter) were likely to be from a single-source and larger irregular spots were more likely to have multi-source origins. It was further hypothesized that for the larger irregular spots, there was overlapping of the stains from different sources and the central regions were very likely to be the overlap areas. Overlapping was least likely to occur in areas at the periphery of these large irregular spots. This calculated approach was utilized in actual cases of gang-rape analyzed in the DNA laboratory in Malaysia. This paper demonstrates two actual cases of seminal stain splatter where this approach was utilized effectively.

Seminal Stains, DNA, Multiple Suspects

168 A Validation Study of DNA Typing From Skeletal Remains by Invitrogen Charge Switch Forensic DNA Purification Kit (Part II)

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When working with DNA extracted from bones and teeth samples, the most common problem is DNA degradation or contamination. Consequently, the success of DNA typing mostly depends on the selection of an appropriate DNA isolation procedure. The researchers of this study previously validated the application of Charge Switch Technology (Invitrogen) to DNA extraction from skeletal remains (bones and teeth) of different ages. In fact CST is designed to obtain a rapid and efficient purification of genomic DNA from a large variety of forensic samples, even if in small quantities. For an application to the analysis of bone, the original study modified the original Charge Switch protocol by using a home made lysis buffer in order to improve the procedure and to remove all contaminants in the sample more efficiently.

In the second step of the study, the goal was to maximize the recovery of DNA from bone samples by using the home made lysis buffer in conjunction with different detergents (SDS, Triton 100, and Tween 20) at variable concentrations. The following samples were used to test the efficiency of extraction solution and to verify the reproducibility of the results: femurs, humeri, tibias, and teeth belonging to three different cadavers of ages one, four and 13 years.

All extracted samples were quantified using the real time PCR-based Quantifiler Human DNA Quantification Kit. The results were then compared to the results obtained from the same samples previously extracted either with the traditional phenol/chloroform procedure or using the silica-based spin columns method.

All samples were amplified by AmpFISTR Identifiler kit and AmpFLSTR Minifiler (Applied Biosystems) using the GeneAmp PCR Systems 9700 and 2720 range of thermal cyclers (Applied Biosystems). The amplified products were analyzed by capillary electrophoresis on an ABI PRISM 3130 Genetic Analyzer (Applied Biosystems).

Even if the quality of bones and the conditions under which the remains were exposed had a big influence on the quality of the DNA, it was observed that the use of Tween 20 in the lysis buffer improved DNA extraction and maximized the potential for success. The results confirm that the Charge Switch Technology can be used routinely for DNA extraction of skeletal remains since the procedure is fast and is capable of efficiently purifying DNA with reliable results.

Bones, Charge Switch Technology, STRs

171 DNA Profiling From Prints Left on the Skin Using the Charge Switch Forensic DNA Purification Kit (Invitrogen)

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The possibility of obtaining DNA from latent prints provides a dual source of identification. Besides the traditional analysis of ridge detail, it is also possible to get a print maker's genetic profile. The advance in technology allows the analyst to consider that even latent fingerprints, left on the skin, may provide cells from which DNA may be extracted.

In fact in many forensic cases, the ability to analyze DNA from fingerprints left by a perpetrator on the skin of a victim could be extremely important to the investigation.

DNA Profiling and Serology

The objective of this study was to develop reliable methods for the extraction and analysis of foreign DNA upon the skin. To accomplish the goal, an assault scenario was simulated using two male-female couples as volunteers. Moreover, in order to identify mixtures of DNA from individuals of the same sex, the experiment was also performed using two other couples: male-male and female-female.

Since high sensitive methods are required for DNA purification from samples containing small biological traces, the Invitrogen Charge Switch Technology (CST) Forensic DNA Purification Kit was used due to the kits ability to obtain high quality DNA from a large variety of difficult forensic samples. In particular, to maximize the recovery of DNA from samples, a modified DNA extraction protocol was developed that employed reduced solutions volumes and a prolonged incubation time.

The quantity of DNA extracted was quantified with Quantifiler Human and Quantifiler Y Human Male DNA Quantification Kits (Applied Biosystems), using a 7300 real-time PCR based system. The DNA was then amplified by AmpFISTR Identifiler Kit and AmpFISTR Y-Filter (Applied Biosystems) using GeneAmp PCR Systems 9700 and 2400 range thermal cyclers (Applied Biosystems).

PCR products were analyzed by capillary electrophoresis on an ABI PRISM 3130 Genetic Analyzers (Applied Biosystems). The quantity/quality of DNA extracted and the quality and reproducibility of DNA profiles obtained were evaluated. It was observed that the combination of the correct sample collection procedure, the CST DNA extraction method, and an appropriate amplification procedure (LCN or not), yielded good and reliable results. However, the success of the analysis varies because it is possible that some people leave more DNA in their prints than others. In conclusion the ability to analyze DNA left onto objects or by a perpetrator on the skin of a victim provides a powerful tool for crime scene investigations.

Fingerprints, Charge Switch Technology, STRs

204 Detection of Apurinic/ Apyrimidinic Sites From Forensic Materials

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A common problem of genetic typing of DNA from forensic material is DNA degradation. DNA is the carrier of genetic information, but it has limited chemical stability. The major causes of DNA degradation are environmental factors such as temperature, humidity, ultraviolet (UV) rays, and burial conditions that lead to hydrolytic and oxidative DNA damage. In addition, some aspects that influence DNA retrieval and amplification from damaged DNA remain unknown. In forensic casework, bloodstains are often the only hint to the identity of an unknown person. Due to the compact nature of bloodstains, the DNA is usually highly degraded after a certain period of time. In a biological sample, DNA damage may rapidly reduce the length and number of starting template molecules that can be amplified by the polymerase chain reaction (PCR). Apurinic/ apyrimidinic sites (AP sites) are very common DNA lesions in human cells, which appear either spontaneously in genome or as a consequence of insult on DNA. In order to evaluate the damage of the template samples, the goal of this study was to detect the numbers of AP sites in bloodstains and UV-exposed epithelial cell samples. The number of AP sites in the isolated DNA samples were determined by DNA Damage Quantification Kit in accordance with the manufacturer's specifications. A total of 500 ng of purified genomic DNA solution was used. The optical density (OD) was measured at 650 nm using a Microplate Reader. The number of abasic sites in the genomic DNA was determined from a calibration curve prepared using standard ARP-DNA solutions. Some genotoxic treatments can give rise to abasic sites either directly as a result of instability of the damaged bases or indirectly during repair of DNA lesions when DNA glycosylases remove the damaged bases producing abasic sites as an intermediary step. As soon as an organism dies, nucleases dominate over repair enzymes and rapidly digest strands of DNA. Under certain conditions such as rapid desiccation, freezing, and high salt concentrations, the nucleases are inactivated before the damage is done. Even if some DNA is left intact, radiation, oxidation and hydrolysis can still cause damage. Furthermore, chemical changes to the remaining DNA fragments may also cause additional problems. For example, the PCR technique is often fooled into inserting inappropriate bases when it is copying an ancient template strand. The results of this study indicated that when bloodstains were stored longer or when oral epithelial cells were treated longer by UV light, the observed number of AP sites increased. However, the STR typing of the increased number of AP sites was difficult. Although AP sites are just one kind of DNA lesion, their presence does represent a marker of DNA damage. Therefore, it is very important to obtain this genomic information from forensic templates or ancient templates.

Forensic Material, DNA Lesion, Apurinic/ Apyrimidinic Sites

222 X-SNP Typing by SNPlex Assay

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The objective of this study was to research the feasibility of X-SNP (single nucleotide polymorphism) typing for forensic identification by using SNPlex™ assay. In this study, 48 SNP loci were selected from the intron areas of X chromosomes. DNA was extracted by the Chelex and organic methods and then quantified by real-time PCR. For each SNP assay, 37ng/μL DNA was used for oligonucleotide ligation with a universal ZipCode™ probe and two SNP-specific ligation probes. After purification and universal PCR, fluorescent-labeled ZipChute™ probes were hybridized to complementary ZipCode™ sequences that were part of the genotype-specific amplification products. The eluted ZipChute probes were detected by capillary electrophoresis on the Applied Biosystems 3130 Genetic Analyzer. Population studies on SNP loci were carried out in samples of unrelated Chinese Han individuals. This method was also applied to casework.

DNA Profiling and Serology

The allele frequency of each X-SNP locus was above 0.3 in the Chinese Han population. No deviations from Hardy-Weinberg equilibrium could be found at the SNP loci. The initial DNA concentration above 50ng/μL was required for typing. X-SNP typing was informative in exclusive cases. The study found that single nucleotide polymorphisms of X chromosomes are a useful class of markers. The SNPlex™ assay is a new methodology for high-throughput SNP analysis. X-SNP typing by SNPlex™ assay can provide valuable information in forensic cases. It can be used for biological identification of relationships between grandmother and granddaughter, or between semi-siblings. The method may also prove useful in cases where samples fail to result in useful information with conventional STR profiling.

SNP, X Chromosome, Zip Code

256 Human Stool DNA Fingerprint

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Biological evidence is often used to obtain a DNA Fingerprint, but the need for improved methods of processing stool evidence has been recognized. The objective of this study was to obtain a DNA Fingerprint from stool smears on crime scene evidence analyzed in the southern region of Thailand. Excision sampling methods were used and DNA was extracted by QIAamp® DNA Mini Kit. The QIAamp extracts were amplified with the AmpFLSTR® Identifier® Amplification kit. Completed profiles were compared to DNA databases for further investigation. The researchers conclude that stool is a significant source of biological material for solving crimes in the southern region of Thailand.

Stool, DNA Fingerprint, Human DNA

273 Population Genetic Study of Twelve Short Tandem Repeat Loci in Western Romanian Population

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Twelve tetra-nucleotide short tandem repeats loci (CSF1PO, TPOX, THO1, F13A, FESFPS, vWA, F13B, LPL, D5S818, D13S317, D7S820, and D16S539) were analyzed in a Caucasian population sample from Transylvania. The amplified STR fragments for the first eight loci were separated and detected using high resolution vertical denaturing polyacrylamide gel electrophoresis and silver staining. Detection was followed by scanning and allele sizing by comparison with the sequence allelic ladders provided in the kit using the Quantity One (bio-rad) software. The PCR product of the remaining four loci contained in the Gemma STR fluorescein kit (Promega Corporation) were separated on a 3730 Genetic Analyzer and the allele designation was made by comparison with the sequenced allelic ladders provided in the kit using the GeneMapper Software v3.5. All loci were statistically analyzed by means of the chi-squared goodness of fit test (i.e. homozygosity test) and the likelihood ratio test. The observed heterozygosities for the investigated STR loci ranged from 0.574 to 0.808. Ten of the observed heterozygosities were greater than 70%, which is a desirable characteristic for loci used in identity testing. All loci were highly polymorphic and the population data generally met the Hardy-Weinberg expectations. The power of discrimination and the probability of exclusion calculated for each locus also support the use of the loci for forensic identification purposes in the western Romanian population.

STR, Identity Testing, Population

345 False Homozygosity in Paternity Studies: Homoplasmy Detection of the SE33 Microsatellite Locus

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Two alleles of the same equal-length microsatellite locus may be generated in separate mutational events. However, the resulting alleles and may not be the same, which creates a more significant cryptic diversity than the one conventionally observed. Although these homoplastic events may not be detected in routine microsatellite testing, some hypervariable loci, such as SE33 (HUMACTBP2), which have very high mutational rates and consequently high intra-allelic variability, lead to the assumption that they contain a significant level of homoplasmy. The identification of this type of events requires joint typing methodologies by size and by sequence of candidate alleles. The study of paternity cases with apparently homozygous children is a reasonable starting point to detect the effects of homoplastic noise.

DNA Profiling and Serology

This study reports the detection of a homoplasic event in the SE33 locus (HUMACTBP2) in a paternity case where the alleles inherited by the child have the same length, but the sequences vary among them. The test was conducted using automated capillary electrophoresis for both allelic assignment and sequence characterization.

The study concluded that STR mutational variability and dynamics must be characterized. Additionally, the constraints of the lab's routine techniques in terms of realistically estimating the population heterozygosity and genetic forensic parameters must be understood. The study also concludes that the identity or kinship rates among individuals analyzed as part of legal investigations could be increased.

SE33, False Homozygosity, Homoplasia

359 An Allelic Microvariant of D7S820 STR Locus in a Romanian Population Sample

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The short tandem repeat (STR) markers used in forensic science are usually tetra-nucleotide repeats located in non-coding regions. The value of STRs as useful genetic markers for population studies increases with their degree of polymorphism. Therefore, identifying new allelic variants for a locus in a certain population increases its value as a genetic marker. Certain STRs, even if they consist of simple tandem repeats, may present alleles with incomplete repeats known as microvariants. During a population genetic study for the D5S818, D13S317, D7S820, and D16S359 STR loci in a Western Romanian population sample, microvariants were identified for the D7S820 locus. The study was performed on a population sample of 200, using the QIAGEN extraction method from whole blood and the PCR amplification of the four loci using the Gamma STR fluorescein kit according to the manufacturer's specifications (Promega Corporation). PCR products were separated on a 3730 Genetic Analyzer (Applied Biosystems) and allele designations were made by comparison with the sequenced allelic ladders provided in the kit using the Gene Mapper Software v3.5 (Applied Biosystems). The D7S820 locus has the chromosomal location 7q and consists of 5-15 repetitions of the core unit GATA. Eleven alleles for this locus have been described up to date, but the allele 5-14 presented microvariants. Allele nine presents all possible microvariants: 9.1, 9.2 and 9.3. The 9.1 variant was observed with the following frequency in certain populations: one in 600 US Caucasians; one in 200 US Hispanics; three in 368 Chinese; and one in 182 Malaysians. At this locus, an individual having a double peak for allele 9 was observed, thus presenting a heterozygous haplotype made of allele 9 and what appears to be the microvariant 9.1, having a population allelic frequency of 0.0025 (one in 200 Romanians). This sample was re-extracted and re-amplified twice in order to ensure consistent results.

STR Loci, Allelic Microvariants, Western Romanian Population

361 A 47-Plex SNPs Typing Method Based on Single-Base Extension and Capillary Electrophoresis Technology

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In this study, a highly sensitive SNP-typing system based on single-base extension and capillary electrophoresis technology was developed. The multiplex consists of 46 autosomal SNPs and one sex-discriminating SNPs on the Y chromosome. These selected SNPs were located at least 100 kb from each other or located on different chromosomes. A novel 47-plex PCR system was established with the amplicons ranging from 55 to 117 bp in length. The 47 loci were divided into two single-base extension reactions using fluorescence-labeled ddNTPs and detected with capillary electrophoresis.

It is possible to obtain a complete SNP profile when the DNA amount ranges from 50 pg to 50 ng. The 47-plex system was efficient when applied in DNA profiling for criminal investigations. This technique proved especially useful for degraded samples when only partial STR profiles had been obtained.

For the purpose of population research, 230 individuals from Guangdong Han were typed. The combined PD (power of discrimination) of the system was larger than 99.9999%, and the MEC (mean exclusion chance) was 0.9994. The PM (match probability) of the personal identification case was 2.1×10^{-19} . The results suggest this system would be ideal for forensic cases, such as paternity testing and personal identification.

SNPs, Single-Base Extension, Multiplex

491 16 Y-Chromosomal STR Haplotype Frequencies in Eastern Mediterranean Region of Turkey

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Y chromosome specific STRs are forensic markers used for the analysis of paternity cases and individualization of forensic biological materials. Using YSTRs as inclusion evidence requires population genetic profile definitions with a large number of databases. This study determined the frequency distribution of 16 YSTR markers: *dys456, dys389i, dys390, dys389ii, dys458, dys19, dys385, dys393, dys391, dys439, dys635, dys392, Y-GATA-H4, dys437, dys438* and *dys448* in 77 unrelated Turkish males from the Eastern Mediterranean region of Turkey. One-hundred and three total haplotypes for the 16 YSTR loci were detected. The smallest haplotype diversity was calculated as 0.426 for *dys389i* and the highest haplotype diversity was calculated as 0.813 for *dys458* in this region. The study found that the 16 YSTR polymorphisms provide a powerful means of discrimination for paternity cases and the individualization of forensic biological materials. In addition, the determined haplotype frequencies were compared with the existing data from other countries.

Y Chromosome, YSTR, Forensic Markers

521 Evaluation of DNA Extraction Methods for Highly Degraded Skeletal Remains

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Each year, a large number of human remains are found that cannot be identified by traditional gross morphological methods such as visage, dental, radiological, or fingerprinting. The condition of these remains varies widely and, in many cases, pieces of a disarticulated skeleton are all that are ever recovered. Endogenous, PCR amplifiable nuclear and mitochondrial DNA can persist in skeletal remains for thousands of years. However, currently applied methodologies for generating nuclear genetic profiles from highly degraded samples do not always yield full STR profiles. New tools and techniques are constantly becoming available which offer the opportunity to obtain more genetic information from highly degraded samples. Four main components of the DNA extraction process were evaluated: bone surface decontamination, bone pulverization, decalcification, and separation of nucleic acids from undesirable compounds. Both chemical (sodium hypochlorite) and mechanical (surface sanding, UV irradiation) surface decontamination methods were examined. Additionally, bone powder was generated by pulverization in a freezer/mill for various amounts of time to determine the impact of bone particle size on DNA recovery. Partial and total decalcification of bone powder versus volume of decalcification buffer and its effect on DNA yield was evaluated. Commercially available silica columns such as QIAquick® and QIAamp® were evaluated relative to organic extraction with phenol/chloroform and volume reduction via microconcentrator for total DNA recovery and removal of inhibitory compounds. Finally, resulting DNA was quantified with Quantifiler™ and analyzed utilizing the thirteen core nuclear STR loci with COfiler™, Profiler Plus™, and MiniFiler™. Profiles were analyzed for quality and completeness. The resulting protocol is streamlined and provides maximum yield of DNA free of compounds inhibitory to downstream applications. Added benefits of a simple and robust protocol are cost reduction (less reagent and labor expense), and a reduced likelihood that the procedure will have to be repeated. The latter benefit becomes critical in cases where the quantity of bone available for DNA isolation is limited. Rapid, robust DNA isolation, the ability to amplify total DNA derived from a sample, and an array of choices for genetic analysis may also provide access to enough information from cases that lie on the fringe of what is currently possible to identify.

Skeletal Remains, DNA Extraction, STR Profile

566 Development and Application of a 2-D Microchip-Based Process for Volume Reduction and Purification of Total Nucleic Acids

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Solid phase extractions (SPE) using silica-based solid phases have proven to be highly reliable and reproducible in forensic settings. A similar silica-based SPE method has been proven transferable to microfluidic devices for the purification of DNA, as demonstrated by Bienvenue, et al.¹ There are numerous advantages in utilizing microfluidic devices for forensic analyses including reductions in analysis time, cost of instrumentation, and reagent consumption, as well as the ability to be combined with downstream analytical processes on a single microfabricated device.² In addition, there is an inherent reduction in sample consumption, which is important in forensic casework when sample is limited. More recent studies demonstrate the effectiveness of the same silica-based microchip extraction method in the isolation and purification of RNA.³ The self-contained microdevice provides an environment for RNA extraction with less opportunity

DNA Profiling and Serology

for the introduction of RNases, allowing for more efficient purification of RNA by reducing sources of contamination and degradation. Working with small amounts of sample is realized in microfluidic extractions. However, larger samples, on the order of milliliters, are often generated in casework in the collection of samples from fabrics and surfaces that still require standard processing because they are not compatible with current microchip devices.

The presented research describes a two-dimensional microchip-based method that brings together two orthogonal processes that sequentially carry out sample volume reduction and purification of nucleic acids from dilute biological samples. Volume reduction solid phase extraction (vrSPE) was performed using a silica phase to remove impurities and to concentrate the sample down to a suitable volume for a subsequent SPE on a single microdevice. A newly-developed method for DNA and RNA extraction was used in the SPE performed after the volume reduction. The method involves the use of chitosan-coated silica beads as a solid phase, which binds and releases nucleic acids based on a pH-induced charge switch.⁴ The advantage of this phase over silica is that it completely avoids the use of PCR inhibitors such as guanidine hydrochloride and 2-propanol used in typical silica-based SPE. Nucleic acids are eluted at a pH compatible with PCR buffer, allowing for future integration into a micro-total analysis system. This work demonstrates the effectiveness of the vrSPE method coupled with chitosan-based SPE as a method for isolation and purification of nucleic acids. An integrated device design is presented with preliminary results from the individual SPE phases. Data from downstream PCR analysis following purification of nucleic acids from various biological samples is reported, and the results from this work will demonstrate the first integrated microfluidic device for volume reduction and total nucleic acid purification utilizing an aqueous chitosan SPE method.

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Nucleic Acids, Microchip, Extraction

254 STR-Typing of Vitreous Human DNA for Forensic Cases

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The goal of this study was to solve the problem of contamination and degradation of evidences from dead body. In this study, the vitreous humor was taken for the extraction of DNA instead of the typical toxicological analysis. Vitreous Humor solution was extracted by the DNA IQTM Extraction Kit. DNA was obtained in the amount of 2.845 ng/ul. The DNA Extract was amplified with the AmpFLSTR® Identifiler® Amplification Kit and, for the first time, a full DNA profile was obtained from the vitreous humor. The DNA profile was compared with the DNA profile obtained from blood. The researchers conclude that vitreous humor should be considered as an alternative sample to blood specimens. This case study will hopefully be a good starting point for those contemplating a fresh investigation into the aspects of postmortem DNA analysis.

STR, Vitreous Humor, DNA

35 A Simple Methodology for Routine Coca Leaves Analysis

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Since 1975, the Narcotics Team of the National Institute of Legal Medicine and Forensic Sciences has specialized in the analysis of drugs of abuse, and controlled substances and plant material used for illegal drug production, including cocaine.

Colombia and the Andean Region countries have the world's largest coca crops used for illegal cocaine manufacturing. Therefore, the lab has developed a simple, fast, and economical method for routine analysis of coca leaf and plant material seized from cocaine production labs.

This method is based on Liquid-Solid Extraction of the major alkaloids found in coca leaf samples (Methylecgonine and Cocaine). A sample of 50 mg of dry, ground coca leaf is weighed and alkaloids are extracted with 30% Acetone/Ammonium Hydroxide (10:1). Tetracosane (C24) is used as Internal Standard.

Acetone may be replaced with Methanol, Ethanol, Ethyl acetate, Chloroform, or Hexane, but Ammonia may not be replaced.

If exhibits are wet and decomposed, using two grams or more is recommended, together with the use of GC-MS in SIM mode, in search for characteristic cocaine ions (82, 182,303)

Alkaloids were identified using Agilent 6890N Gas Chromatograph with Agilent 5975 Mass Selective Detector in Full Scan mode. GC-MS may be replaced with a GC-FID (in this case certified standards are required)

The method was validated following SWGDRUG Recommendations, 3rd Edition (2007-08-09) for the validation of analytical methods. The following results were obtained:

- Selectivity: Sufficient to enable full separation of Methylecgonine, Cocaine, and Tetracosane from other Coca leaf components.
- Matrix effects: Sufficient to enable full separation of heroin from diluents and cutting agents typically found in street samples
- Recovery: > 90%
- Precision (Repeatability): < 10%
- Precision (Reproducibility): < 10%
- Trueness: < 10%
- Limit of detection (LOD): 22.5 mg (Dried); 100.0 mg (Fresh)
- Linearity: correlation coefficient > 0.99
- Robustness: sufficient for routine work
- Ruggedness: not significant as the method will be applied only in one laboratory.

This method may be useful to forensic labs located in cocaine production areas or developing countries.

Coca Leaves, Cocaine Extraction, GC-MS

164 Determination of Cocaine and its Metabolite Benzoylcgonine in Hair Using Liquid Chromatography-Tandem Mass Spectrometry

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A sensitive LC-MS/MS method has been developed for the determination of cocaine and its major metabolite benzoylcgonine in hair. The hair sample preparation involved decontamination, acid hydrolysis and a liquid-liquid (dichlormethane) extraction. Deuterated cocaine and benzoylcgonine were used as internal standards. The analysis was performed by positive electrospray ionization, and multiple reactions monitoring (MRM) mode was used. The limit of detection (LOD) for cocaine and benzoylcgonine was 1.0 pg/mg when 20 mg hair segment was processed. The calibration curves were linear over a range of 5.0-250pg/mg for both analytes. The validated method was successfully applied to the analysis of cocaine and benzoylcgonine in guinea pigs' hair after a single dose. Hair samples were obtained from a controlled animal treatment experiment. Four guinea pigs which had multiple colored hair were injected with high dose of cocaine (10mg/kg) and the other four received low dose (0.4mg/kg). After a intraperitoneal injection, hair segments in different colors were collected separately on the 7th and 14th day post dose. Both cocaine and benzoylcgonine were detected in the first week. Additionally, there was a higher concentration of cocaine than that of benzoylcgonine occurred in hair because of their different physicochemical properties; the incorporation of cocaine and benzoylcgonine into hair has close relationship with given dose and hair color.

Cocaine and its Major Metabolite Benzoylcgonine, Hair, LC-MS/MS

196 Physiological Concentrations of Endogenous Anabolic Steroids in Human Hair

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Doping with endogenous anabolic steroids is one of the most serious issues facing sports today. The measurement of anabolic steroids in human hair is necessary to distinguish between pharmaceutical steroids and natural steroids. It is the first time to investigate the physiological concentrations of anabolic steroids in human hair from Chinese people. A method of gas chromatography–tandem mass spectrometry (GC/MS/MS) was developed for the simultaneous identification and quantitation of five endogenous anabolic steroids (testosterone, epitestosterone, androsterone, etiocholanolone, dehydroepiandrosterone) in hair. After basical hydrolysis, hair sample was extracted with diethyl ether, derivatized and detected using GC/MS/MS in the multiple-reaction monitoring mode. The one precursor/two product ion transitions for each anabolic steroid were monitored. The limits of detection for five endogenous anabolic steroids were in the 0.1~0.2pg/mg range. All analytes showed good linearity and the extraction recoveries were 74.6~104.5%. Within-day and between-day precisions were less than 20%. This method has been applied to the analysis of testosterone, epitestosterone, androsterone, etiocholanolone, and dehydroepiandrosterone in human hair. Full-length hair samples were taken at the surface of the skin from the vertex of 39 male, 30 female and 11 children from China. None of the subjects were professional athletes. Testosterone and dehydroepiandrosterone were detected in all the hair segments. The physiological concentrations of testosterone were in the range 0.8-24.2 pg/mg, 0.1-16.8 pg/mg and 0.2-11.5 pg/mg for male, female and children, respectively, but the mean value of dehydroepiandrosterone were much higher than the concentrations of testosterone. These data is the suitable reference and the basis for the interpretation of the results from endogenous anabolic steroids of abuse.

Gas Chromatography Tandem Mass Spectrometry, Endogenous Anabolic Steroids, Hair Analysis

130 Proteomics-Based Method for the Identification of Human Growth Hormone (HGH)

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Recent publicity surrounding the purported use of performance-enhancing drugs such as steroids and Human Growth Hormone (HGH) by professional athletes has focused on the need for more stringent anti-doping testing protocols and the ability to identify unusual substances. HGH is often seized and submitted to forensic laboratories in conjunction with steroids. The analysis of steroids is relatively straightforward; however, most forensic laboratories are not familiar with analyzing exhibits of HGH, and qualitative methods are needed to perform these analyses. Addressing this issue will enable accurate and consistent reporting of HGH and provide valuable intelligence as to the frequency in which it is encountered by law enforcement personnel. HGH is a small protein, but it is still approximately 50 times larger than regularly encountered drug substances, and it therefore cannot be identified using the instrumentation and methodologies typically utilized in a common forensic drug laboratory. Herein, the analysis of HGH using a proteomics approach is presented that meets the SWGDRUG recommendations for the identification of unknown substances.

Human Growth Hormone, Proteomics, Performance Enhancing Drugs

638 Operation Reap - Towards True Hydroponic Yield Estimates

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Much of the Cannabis seized in recent years has been hydroponically grown – a method that, in contrast to the more traditional outdoor plantations, enables strict control of light intensity, photoperiod, temperature, and nutrient availability. It also allows the completion of up to five growth cycles a year, while at most New Zealand latitudes only one outdoor crop can be successfully grown in the same period. The environmental control and continuous cropping of hydroponic cultivation greatly increase the potential annual yield for a particular number of grow sites; however, a lack of data with which to calculate the yield and thereby the potential income of these operations has hampered the New Zealand Courts in applying appropriate penalties.

While there has been some research done on outdoor seizures in New Zealand and overseas, the controlled hydroponic rearing of Cannabis clones to the point of sale over an annual period has not been published, either in New Zealand or internationally. This paper describes how a hydroponic grow-room was set up, and the highs (and lows) of growing six plants in a single garage for three cycles over the period of a year. Apart from yield, data was collected on the tetrahydrocannabinol (THC) concentrations of the plants, and DNA analysis was undertaken, resulting in some unexpected conclusions.

This project is a collaboration between the Wellington Organized Crime Squad of the New Zealand Police, and forensic scientists employed by the Institute for Environmental Science and Research Ltd. (ESR), which is a Crown-owned organization responsible for delivering most of New Zealand's forensic science requirements.

Cannabis, Hydroponic, Yield

100 Remote Detection of Outdoor Cannabis Grow-Ops

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Sponsored by the Canadian Police Research Centre (CPRC), the main objective of this project was to generate a retrospective assessment to highlight the utility of remote sensing (i.e. spectrometry and airborne/satellite imagery) to locate illegal grow-operations of Cannabis sp. The project included both field and laboratory components. The main tasks were to conduct a detailed spectral assessment of reflectance collected in-situ for Cannabis in comparison to the vegetation in which it is most often camouflaged and to conduct an assessment of airborne and satellite imagery where outdoor grow-ops are known to be located. It was found that Cannabis has a spectral signature that can be differentiated from other vegetation for the study areas in Western British Columbia (BC), Canada. Based on the specific wavelength regions that were found to be the most distinctive, the analysis was scaled up to the airborne and satellite imagery. In comparison to sites identified in the field from conventional spotting methods, it was found that approximately 30% of outdoor grow-ops are being missed. The second phase of the project sponsored jointly by CPRC and Public Safety and Emergency Preparedness Canada (PSEPC) involved a compilation of information regarding the ecology, chemistry, spectral properties and growing trends of Cannabis that would facilitate its detection. From the review of the literature it was found that in BC outdoor grow-ops have been steadily increasing in size and number. In addition, the environment has been shown to influence the chemical composition of the Cannabis which in turn is likely to influence the spectral properties. The third phase of the project involved a spatial analysis of Southern BC and the Gulf Islands to identify the most likely and optimal growing sites as a means to best allocate detection resources. The final components involved a validation/optimization of the detection model and an investigation of the effect of soil type on the reflectance of Cannabis as a means to maximize the areas where it could be applied.

Cannabis, Remote Sensing, Detection

661 Analyzing Salvia Divinorum and its Active Ingredient Salvinorin A Utilizing Thin Layer Chromatography and Gas Chromatography / Mass Spectrometry

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In recent years, Salvia divinorum has become a major focus by state legislatures throughout the United States looking to prohibit the sale of the psychoactive plant. While still legal to purchase in California and the majority of states throughout the country, Salvia divinorum will most likely become a Schedule I Controlled Substance within the next few years, as expressed by a Drug Enforcement Administration Chief (1). Because of this statement and current California Assembly Bill 259 (2), the San Bernardino County Sheriff's Department's Scientific Investigations Division has taken steps to insure proper testing procedures are available to analyze Salvia divinorum and its active chemical ingredient salvinorin A.

After researching testing procedures presented in the literature and those employed by other crime laboratories throughout the country, it was decided that Thin Layer Chromatography (TLC) and Gas Chromatography / Mass Spectrometry (GC/MS) were the methods to use in order to analyze for salvinorin A. With Thin Layer Chromatography, salvinorin A was detected from extracted plant material and was easily distinguishable from thirteen other Salvia species as well as Cannabis sativa L. (marijuana). When using GC/MS, salvinorin A was best extracted from plant material with chloroform at an ambient temperature when using a non-polar solvent and acetone at an ambient temperature when using a polar solvent. By utilizing these two techniques, criminalists are now able to confirm the presence of salvinorin A in a submitted plant material suspected to be Salvia divinorum.

Salvia Divinorum, Hallucinogenic Plants, Salvinorin A

703 The Scientific Working Group for the Analysis of Seized Drugs (SWGDRUG)

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The objective of this presentation is to update forensic drug analysts on recent work products from the Scientific Working Group for the Analysis of Seized Drugs (SWGDRUG). Currently SWGDRUG is working on the following topic: Uncertainty in measurements. This topic has been discussed widely in the forensic science community. During this presentation, the current status of SWGDRUG's work products will be discussed. Representatives from the SWGDRUG Core Committee will answer questions and address the concerns of attendees.

This year's presentation will focus on the specifics described above. However, the following information is presented here for those unfamiliar with the SWGDRUG process. SWGDRUG has been in existence since 1997. The mission of SWGDRUG is to recommend minimum standards for the forensic examination of seized drugs and to seek their international acceptance.

The objectives of SWGDRUG are the following:

- Specifying requirements for forensic drug practitioners' knowledge, skill and abilities,
- Promoting professional development,
- Providing a means of information exchange within the forensic science community,

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- Promoting ethical standards of practitioners,
- Providing minimum standards for drug examinations and reporting,
- Establishing quality assurance requirements,
- Considering relevant international standards and
- Seeking international acceptance of SWGDRUG recommendations

Drug abuse and trafficking in controlled substances are global problems, and in recent years law enforcement has looked to international solutions for these problems. In 1997 the United States Drug Enforcement Administration (DEA) and the Office of National Drug Control Policy (ONDCP) co-sponsored the formation of the Technical Working Group for the Analysis of Seized Drugs (TWGDRUG), now known as SWGDRUG.

The SWGDRUG core committee is comprised of representatives from federal, state and local law enforcement agencies in the United States, Canada, Great Britain, Germany, Japan, Australia, the European Network of Forensic Science Institutes (ENFSI), the United Nations Drug Control Program (UNDCP), forensic science educators, the American Society of Crime Laboratory Directors (ASCLD), ASTM, and the National Institute of Standards and Technology (NIST). All members of the core committee have worked together over the past 10 years to build a consensus on the development of recommendations which have impacted forensic drug analysis standards internationally.

SWGDRUG Core Committee members have received hundreds of responses to international surveys and requests for comments from forensic drug analysts. Methods of communication have included: an internet website site (www.swgdrug.org), MICROGRAM, presentations at numerous local, national and international meetings, and personal contacts.

Published recommendations (www.swgdrug.org) have been available since 2000 to forensic scientists around the world. These recommendations have addressed Methods of Analysis, Education and Training, and Quality Assurance issues. All recommendations were developed with input from the international forensic drug analysts community.

SWGDRUG, Seized Drugs, Uncertainty

506 Fentanyl, Multiple Fatalities, and Forensic Science: A Multidisciplinary Symposium

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Fentanyl was first synthesized by a Belgian pharmaceutical company in the late 1950s. With an analgesic potency of about 80 times that of morphine, fentanyl has been a legitimate product since the 1960s. However, multiple fatalities due to fentanyl abuse have been reported worldwide. Recently, there were over a thousand fentanyl related deaths in the United States. This symposium will describe this epidemic from the perspective of a forensic pathologist who was one of the first to become aware of the acute problem, a forensic toxicologist who confirmed the cause of death in other cases, and forensic chemists who analyzed seized samples containing fentanyl. The role of the forensic chemist is not only to analyze seized samples for the presence or absence of controlled substances, but also to provide intelligence to law enforcement personnel. In this vein, efforts to determine whether samples have a common origin and/or the synthetic route for the manufacture of fentanyl, based on trace impurities present, will be described. Finally, methodology will be presented for the chemical analysis of a number of other fentanyl derivatives, some of which have already been encountered.

Forensic Pathology, Forensic Toxicology, Fentanyl Profiling

711 DESI-MS: A New Tool for Forensic Chemistry Laboratories

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New atmospheric pressure ionization interfaces have expanded the applications and use of mass spectrometry (MS) in the crime laboratory. Desorption electrospray ionization (DESI), an extension of the electrospray ionization technique, is one of the latest techniques developed in this area, and it has recently been applied to the analysis of controlled substances in the forensic chemistry laboratory. The most valuable application of the technique is during the pre-analysis or screening of multi-unit exhibits. Here, the application of DESI-MS and DESI-MS/MS experiments to the rapid analysis of controlled substances will be presented.

The DESI-MS technique can provide reproducible molecular weight information with a high degree of sensitivity. It reduces analysis times without interferences or cross-contamination. Its applicability, as a presumptive test will be discussed. DESI-MS/MS experiments are appropriate for the rapid confirmatory screening of multiple-unit exhibits, adding another tool to today's forensic analysts by providing structural information via fragmentation data that can be directly compared with standard reference spectra. Initial studies performed in our laboratory will be summarized, and more recent applications of DESI-MS will be discussed. Examples will include the identification of active ingredient(s) contained in counterfeiting formulations, analysis of liquids, "medical" marijuana items, chocolate-covered opium, and multi-component Ecstasy exhibits.

DESI-MS, Forensic Chemistry, Laboratories

36 Drugs of Abuse and Smuggling Techniques Used in Colombia

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Since 1975, the Narcotics Team of the National Institute of Legal Medicine and Forensic Sciences has specialized in the analysis of drugs of abuse and controlled substances used for cocaine and drug manufacturing.

Based on the amount and type of samples (exhibits) received by the lab, current cocaine manufacturing techniques and concealment practices used by drug traffickers to smuggle narcotics out of the country will be described.

Cocaine manufacturing processes in Colombia have not changed significantly in the last twenty years. The only major change is standardization, because clandestine labs transform coca leaf into cocaine hydrochloride in the same place.

Some chemicals used to produce cocaine include Cement or Calcium Oxide, Gasoline or Diesel, Sulfuric Acid, Potassium Permanganate, Acetone, Hydrochloric Acid, and others.

The cost of one kilogram of Cocaine-HCl in the Putumayo area ranges between 800 and 1000 dollars. Cocaine is sometimes used as currency.

Drug analysis methods in Colombia consist of preliminary and confirmation analyses. Preliminary analysis is conducted at the actual crime scene. Field tests are called Standard Preliminary Evidence Identification and lab tests are called Standard Expert Examination. The latter are conducted in the lab, following SWGDRUG recommendations.

The major drugs of abuse used in Colombia are cocaine (and Cocaine mixtures, e.g. Cocaine and Caffeine, Cocaine and Phenacetin, etc.), marijuana, and heroin. The use of amphetamines, benzodiazepines, and other synthetic drugs is not significant, probably due to lack of synthetic drug investigations and/or lower street prices for cocaine, marijuana, and heroin.

The latest concealment techniques used by drug traffickers to smuggle cocaine out of Colombia will be described. Concealment techniques are divided into two major groups: "Physical Concealment" and "Chemical Concealment", depending on drug extraction methods.

Physical concealment means that drugs are concealed inside the exhibit. In this case, drugs are extracted by physical means. For example, cocaine smuggled inside a computer part (e.g. hard disk) is extracted by separating cocaine from the rest of the computer components without chemical extraction.

Chemical concealment means that a component or a part is made of cocaine. In this case, drugs are extracted through chemical extraction, because physical extraction is impossible. For example, cocaine may be smuggled in rubber-like bag components. In this case, chemical extraction is required to isolate cocaine from rubber compounds.

In both cases, a representative sample of the exhibit is taken. Subsequently, drugs are physically or chemically extracted. Finally, drugs are analyzed following SWGDRUG recommendations.

Cocaine Production, Drugs of Abuse, Smuggling Techniques

603 Direct Multi-Analyte Detection of Contact Residues and Metabolites in Latent Fingerprints Using SALDI-TOF-MS-MS

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Latent fingerprints are generally detected at crime scenes by use of a dusting agent. These prints are then often lifted using lifting tape and the prints stored. The information resides solely in the patterns associated with the developed print. We now present a new method that enables the chemical composition of prints to be directly obtained from the pre-powdered lifted print. The method utilizes the ability of a new type of dusting agent based on silica micro- and nanoparticles to act both as means of obtaining prints of good structural definition and subsequently as an ionizing/desorption agent for use in laser desorption/ionisation-time of flight-mass spectrometry (LDI-TOF-MS). This method is also known Surface-Assisted-LDI-TOF-MS (SALDI-TOF-MS). We present examples where this approach is used to identify contact residues, or endogenous metabolites, or exogenous compounds such as drugs and their metabolites, within latent prints. Use of SALDI-TOF-MS-MS provides unique fragmentation patterns which can be used as for the unambiguous identification of the analytes that can be potentially used in a court of law. Finally examples of pattern of distribution derived from the MS data, for specific metabolites and contact residues within pre-dusted latent prints will be shown.

Latent Fingerprints, Contact Residues and Metabolites, SALDI-TOF-Mass Spectrometry

407 Characterization of Carbon Paper from Illicit Drug Seizures

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Carbon paper is relatively commonly found as a packaging material in drug seizures made by the Australian Federal Police. Unfortunately, little information is available about the intelligence value of this material. In this study, differences within batches of the

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same brand of carbon paper and a technique that allows for a carbon smudge to be linked back to a carbon paper source was investigated. In total 72 different brands of carbon paper were collected from Australia and around the world, 36 blue and 36 black samples. The two colors were analyzed separately. Optical examination of the carbon paper samples was undertaken first, followed by microscopic analysis, light box transmission and instrumental analysis by MSP, FTIR, TLC, and HPLC.

Optical examination was able to discriminate most sample pairs, with a DP of 0.97 and 0.94 for the blue and black samples respectively. Microscopic analysis provided no new information that could discriminate between samples, while light box transmission analysis could discriminate between around 60% of the samples pairs for both colors. Microspectrophotometry was useful to discriminate between the blue samples with a DP of 0.82, but could not discriminate the various black samples.

FTIR analysis of the carbon side of the samples had a high DP for both color with 0.87 for the blue sample pairs and 0.82 for the black sample pairs. FTIR analysis was undertaken for the back of the samples that had plastic backing, providing a DP of 0.75.

TLC provided the best discrimination of the chemical techniques for the blue samples with a DP of 0.92, but gave a low DP of 0.73 for the black samples, as many of the black samples were insoluble in the solvent.

The HPLC analysis was undertaken on only those samples not discriminated by TLC, but showed no further discrimination.

When the chemical analytical sequence was followed, a final combined DP of 0.99 for the blue samples and 0.96 for the black samples obtained. The optical examination followed by chemical analysis gave a DP of 0.995 for both the blue and black samples. Only three blue brands and three black brands could not be discriminated.

It is worth noting that all samples with a plastic backing had a brand logo printed on the back, and thus could be discriminated on this basis. The sequence of analysis recommended is optical examination, light box transmission, microspectrophotometry for the blue samples only, FTIR and finally TLC.

Illicit Drug Packaging, Carbon Paper, Discrimination

559 Global Warning: Internet Open Access to Designer Drugs and Chemical Cocktails

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The Internet has revolutionized the global marketplace, from small home-based businesses to large international corporations. Consumers have the ability to shop for goods and services from around the world. These products include foods, dietary supplements, drugs, and pharmaceuticals which are regulated by the Food and Drug Administration (FDA). There is a need to rapidly identify key product ingredients, and screen for the presence of harmful substances. FDA Forensic Chemistry Center casework frequently involves dietary supplement and pharmaceutical consumer products which have been purchased via the Internet. These include products marketed as energy boosters, nootropics, traditional Chinese medicines, sexual performance enhancers, generic pharmaceuticals, designer drugs, cure-alls, and for weight reduction. In this presentation, difficulties in conducting this type of product analysis will be outlined, such as the need to obtain chemical standards for substances which are either unavailable or illegal in the United States. Results of the forensic examination and analysis of several different products will also be presented, including products which were found to contain drug analogs, designer drugs, prescription pharmaceuticals, and what may aptly be described as chemical "cocktails."

Internet Commerce, Dietary Supplements, Drugs and Pharmaceuticals

147 "Party Pills," "Legal Highs," and Drug Control Policy: The New Zealand Experience

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Legal "party pills" became a feature of the New Zealand dance/party scene from around the year 2000 with the introduction of products containing 1-benzylpiperazine (BZP) and/or analogues such as 1-(m-trifluoromethylphenyl)piperazine (TFMPP). At that time these substances were not controlled under New Zealand drug legislation. It has been estimated that 20 million doses of BZP-containing products have since been sold in NZ. Other party pills or so-called "legal highs" have also made an appearance. Some of these products contain substances covered by the "controlled drug analogue" provisions of New Zealand drug legislation, such as methylone, diphenylprolinol and bk-MBDB.

The Institute of Environmental Science & Research undertakes analyses of drug seizures for law enforcement agencies and the criminal justice system. In this presentation data on findings will be summarized and the New Zealand party pill scene will be described. The debate in New Zealand around appropriate response to "recreational" use of drugs or substances, drug policy options and legislative reform will be described.

Party, Drug, Policy

114 Study on Small Volume Liquid Extraction of Amphetamines

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The presented study was focused on the investigation of factors and mechanism of small volume liquid extraction for four amphetamines, named amphetamine (AM); methamphetamine (MAM); 3,4-methylenedioxyamphetamine (MDA); 3,4-methylenemethamphetamine (MDMA), in biological samples. The extraction efficiency between regular volume and small volume extraction was compared; some factors for small volume liquid extraction such as the kind of organic solvents, solvent volume, concentrations of target analytes in aqueous phase were examined, and the mechanism for this kind of extraction was studied primarily. It was showed that small volume liquid extraction has some effect of enrichment for analytes, the smaller the volume was, and the lower the analytes concentration in aqueous was, the greater the enrichment gained. It could be deduced that organic film between organic and aqueous phases played an important role in the enrichment. Amphetamines in saliva and hair were extracted using the method. After extraction the organic phase was directly injected into GC for analysis, or transferred into another vial for direct derivatization. The limits of detection for the four amphetamines were 0.05 μ g/mL in saliva using GC/MS-SIM without derivatization, and 0.05ng/mg in hair after MBTFA derivatization. The method validation data demonstrated that all parameters like linearity, repeatability, relative standard variation and accuracy, were met the requirement for the drug analysis. The extraction procedure was simple, sensitive, economic and timesaving, which can be used to the analysis of the drugs in any kind of biological specimens.

Small Volume Liquid Extraction, Amphetamines, Saliva, Hair

505 Effect of Chronic Amphetamine on Locomotor Activity in Dopamine D3 Receptor Deficient Mice

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DRD3 dopamine receptor D3 (DRD3) gene encodes the D3 subtype of the dopamine receptor. The D3 subtype inhibits adenylyl cyclase through inhibitory G-proteins. This receptor is expressed in phylogenetically older regions of the brain, suggesting that this receptor plays a role in cognitive and emotional functions. It is a target for drugs which treat schizophrenia, drug addiction, and Parkinson disease. Alternative splicing of this gene results in multiple transcript variants that would encode different isoforms, although some variants may be subject to nonsense-mediated decay (NMD).

To investigate the role of dopamine D3 receptor in chronic amphetamine induced behavior changes, mice with a targeted deletion of the dopamine D3 receptor subtype were used. Chronic amphetamine dependence animal model were induced by intraperitoneally injecting with amphetamine (5mg/kg) once daily for seven consecutive days in dopamine D3 receptor mutant and C57BL/6 mice. Locomotor activity was recorded by activity box before and following each injection. The behavioral response to amphetamine is significantly higher than saline both in dopamine D3 receptor mutant and C57BL/6 mice across days, and dopamine D3 receptor mutant mice is higher than C57BL/6 mice. These findings indicate that the D3 receptor may plays an inhibitory role in the action of psychostimulant on behavior.

Amphetamine, Psychostimulants, Dopamine D3 Receptor

616 Emerging Use of Isotope Ratio Mass Spectrometry as a Tool for Discrimination of MDMA by Synthetic Route

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Drug profiling, or the ability to link batches of illicit drugs to a common source or synthetic route, has long been a goal of law enforcement agencies. Research in the past decade has explored drug profiling with isotope ratio mass spectrometry (IRMS), and this type of research has often been carried out on illicit substances which have been seized by police and are therefore of unknown provenance. In this study, 18 MDMA samples were synthesized in-house from aliquots of the same precursor by three common reductive amination routes and analyzed for ¹³C, ¹⁵N and ²H isotope abundance using IRMS. For these three preparative methods, results indicate that ²H isotope abundance data is necessary for discrimination by synthetic route. Furthermore, hierarchical cluster analysis using ²H data on its own or combined with ¹³C and/or ¹⁵N provides a statistical means for accurate discrimination by synthetic route.

Drug Profiling, 3,4-Methylenedioxymethamphetamine (MDMA), Isotope Ratio Mass Spectrometry (IRMS)

658 Analysis of Designer Drugs of the Amphetamine Type by Fast Gas Chromatography-Mass Spectrometry

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From the early 1990s, many so-called 'designer drugs' were regularly discovered. Over 30 new synthetic drugs were found in police or customs seizures or identified in biological samples in the last 10 years. The drugs identified were largely phenethylamines and other amphetamine-like substances. The studies were aimed at development of simple and efficient screening method of identification of psychotropic substances related to amphetamine.

The study covered broad range of designer drugs of the amphetamine type, including 2,5-dimethoxyphenethylamine (2C-H), 2,5-dimethoxy-4-bromophenethylamine (2C-B), 2,5-dimethoxy-4-iodophenylethylamine (2C-I), 2,5-dimethoxy-4-methylphenylethylamine (2C-D), 2,5-dimethoxy-4-ethylthiophenethylamine (2C-T-2), 2,5-dimethoxy-4-(n)-propylthiophenethylamine (2C-T-7), 2,5-dimethoxyamphetamine (DMA), 2,4,5-trimethoxyamphetamine (TMA-2), 3,4,5-trimethoxy-amphetamine (TMA), 2,5-dimethoxy-4-bromoamphetamine (DOB), 2,5-dimethoxy-4-iodoamphetamine (DOI), 2,5-dimethoxy-4-methylamphetamine (DOM), 4-methoxyamphetamine (PMA) and 4-methylthioamphetamine (4-MTA). Crude and distilled products of these substances prepared in the laboratory, common drugs (amphetamine, methamphetamine), precursors (ephedrine, pseudoephedrine) and common diluents (caffeine, paracetamol, acetylsalicylic acid) were analyzed.

Sample preparation step was optimized. The final procedure started from dissolution of 50 mg of the powder in 1 ml of carbonate buffer (pH 9). The obtained solution was mixed on a rolling extractor for 30 min at 2000 rpm. Then, 1 ml of ethyl acetate was added and it was mixed for another 30 min. The solution was centrifuged for five min at 3000 rpm. After centrifugation, the organic layer was subjected to analysis. DB-5 column (10m x 0.10 mm m) was applied for separation of the substances. Helium at a flow rate of 0.4 ml/min was used as a carrier gas. Oven temperature program started from 100°C (maintained for 0.57 min), then ramped at 30°C/min to 275°C (maintained for 5.5 min), then ramped at 10°C/min to 280°C (maintained for 6.28 min). Mass spectrometer was operated in electron ionization mode (EI). Mass spectra were recorded in a range from 10 to 450 amu.

The method turned out to be efficient. It enables separation of more than twenty substances within 15 min with a separation factor higher than 1.5. The method is useful for both routine screening for unknown substances in powders or tablets (after their preliminary crushing) and the analysis of their impurities, which is of a great importance in comparative analysis of seized drugs.

The study was supported by the grant O N204 0060 33 of the Ministry of Science and Higher Education, Warsaw, Poland.

Designer Drugs, Fast GC/MS, Seized Drugs

216 Synthetic Drug and the Colombian Experience

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Illegal drugs are classified as plant-derived and synthetic drugs, based on their nature. Plant-derived drugs may be natural, such as marijuana and opium, or processed, such as cocaine, heroin, and "bazuco" (freebase).

Synthetic drugs most commonly used in Colombia are amphetamines and methamphetamines. The most frequent active ingredients of these drugs are ephedrine, pseudoephedrine, safrole, and piperidine. While amphetamines may cause physical addiction, methamphetamines may result in psychological addiction. These drugs are normally sold in one-fourth, half gram, and one gram amounts for personal use. These drugs produce a "high" that lasts 30 minutes. The duration of the remainder of the effect may range from four to 16 hours, depending on the amount used, the individual's physical constitution, and whether the individual is a regular or an occasional user.

Synthetic drug use may cause behavioral changes such as: psychotic behavior; paranoia; hallucination; anxiety; fatigue; depression; delusion; confusion; insomnia; or aggressive behavior.

These drugs may also result in health problems and other complications, such as: stroke; Alzheimer's disease; weight loss; or death.

Synthetic drug use has increased consistently in Colombia in recent years. Cases of teenager users as young as 14 - 15 years old have been reported.

The largest synthetic drug seizures are usually conducted on the Andean region, in large cities such as Bogotá, Cali, Medellín, Barranquilla, and Manizales. The largest manufacturers of finished synthetic drugs are Mexico, Canada, the Netherlands, Thailand, Belgium, and Spain. The major producers of the raw material smuggled into Colombia for manufacturing purposes are Burma, Thailand, Poland, India, and México.

The Colombian government is making efforts to control synthetic drug use, trafficking, manufacturing, and sale. Training, education, and awareness campaigns have been launched. Additionally, enforcement measures have been taken with the assistance of international and national drug control agencies and through the enforcement of applicable national and international laws.

Synthetics Drugs, Colombia, Methamphetamines

583 Methods for the Detection of Illicit Substances in Latent Fingerprints by Infrared Spectral Imaging

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Infrared spectral (or chemical) imaging enables the simultaneous collection of thousands of infrared spectra across a sample. This information can be used to map the location of chemical species in the sample, and has led to the infrared spectral imaging of latent and cyanoacrylate-developed fingerprints, as demonstrated previously. This work focuses on the use of spectral searching algorithms to locate and identify the spectra of illicit substances within fingerprints deposited by suspects in custody. Unlike conventional spectral searching applications, where a sample spectrum is searched against a library of high quality reference spectra, searching for illicit substances in the spectral image of a fingerprint involves comparing one high quality reference spectrum with a large number of poor quality and /or "empty" spectra. This is because the illicit substance may contribute to a very small number of the spectra in the image, and so the use of commercial searching software may not be appropriate. The work described in this presentation compared the performance of common (and less common) spectral search algorithms, along with different spectral pre-processing techniques, in their ability to rank the spectra in a fingerprint image according to their similarity to one or more reference spectra of substances such as illicit drugs, explosives and pharmaceuticals. The recommendations made are applicable to spectral imaging in other frequency ranges, such as the UV-visible and near infrared.

Infrared Chemical Imaging, Explosives, Spectral Searching

607 Research on Tracing the Source of Drugs by Plastic Bags Analyzed by FTIR

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The plastic is playing an important role in the social life. It often appears as the material evidence at the criminal sites. The analysis on the different structures and characters of plastic can provide the instructions and the clues for the detection. We have analyzed some common white color plastic shopping bags from bazaars, stores and supermarkets. These bags are made by 21 different manufactures and popularly used by the drug smugglers in China or other countries. We found, except the spectra of two samples were similar, the rest samples all had each specific absorbance spectrum, which could be highly distinguished.

Sample preprocessing is not necessary by the infrared spectroscopy, which is an effective way to identify the common plastic shopping bags and trace the source of drugs. The plastic can be tested nondestructively, rapidly and accurately.

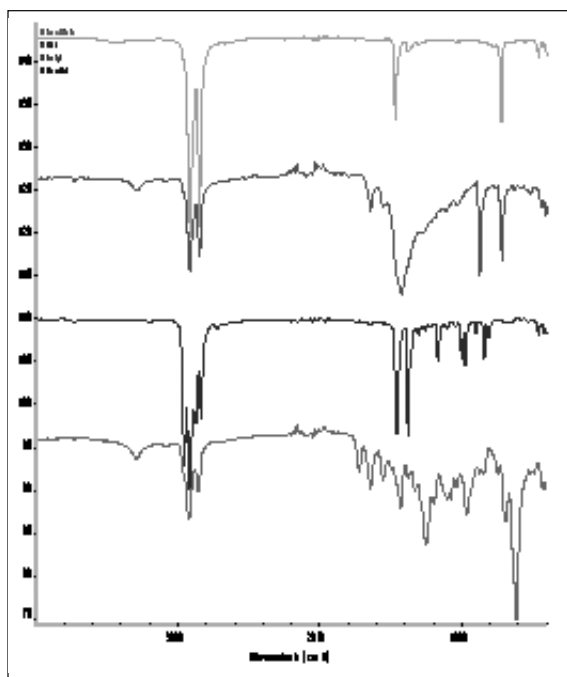


Figure 1: IR Spectrum of 4 kinds of 21 plastics

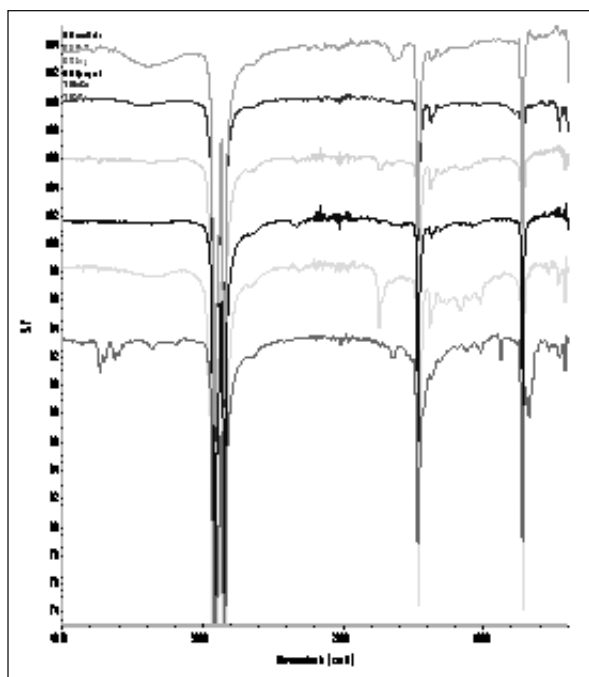


Figure 2: IR Spectrum of 6 kinds of PE

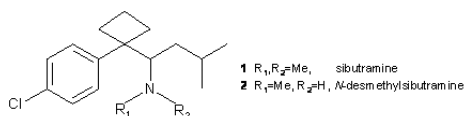
436 Identification of the N-Desmethylsibutramine as a New Active Ingredient in Chinese Herbal Medicine

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In Poland and many other countries, regulatory agencies do not have jurisdiction over the use and sale of "traditional" Chinese herbal preparations. Consequently, the use of such "undefined" medicines becomes a gamble for the consumers because of the lack of information that provides the true composition of the medicine. The identification of harmful ingredients, which could be responsible for adverse effects, is a major problem due to the large number of constituents in the herbs, the diversity of their chemical structures, and the undefined purity of the plant material^[1].

In Poland, the concern associated with the use of so-called traditional herbal Chinese medicines appeared several years ago (in the early 2000's). In many incidents, the patients who took preparations called Mezintac, LiDa, and Adipex, suffered from life-threatening adverse effects such as high blood pressure, cardiac arrhythmias, and increased heart rate. Producers declared these herbal food-supplements, which were offered via the Internet as weight-loss assisting agents, to contain only typical plant preparations such as lotus leaves, madder, and pumpkin and bottle gourd seed extracts. However, the examination of the capsules by means of the GC-MS, IR and NMR methods revealed the presence of sibutramine hydrochloride as a main active ingredient. This pharmaceutical was not listed on the manufacturer's labeling. Sibutramine is the first of a new class of compounds for the treatment of obesity. Developed by Knoll Pharmaceuticals in the 1980s, clinical examinations of sibutramine have been shown to cause marked weight reduction^[2].

Recently, the Department of Criminalistics (Internal Security Agency) received several capsules with the trade name LiDa (LiDa Dai Dai Hua Jiao Nang), which were initially supposed to contain sibutramine hydrochloride 1. The content of the capsules was analyzed by GC-MS, IR and NMR and was found to contain N-desmethylsibutramine 2. N-desmethylsibutramine is well-known metabolite of sibutramine^[3].



The goal of this presentation is to provide the analytical data used in the conclusive identification of this so far unknown ingredient of the Chinese anti-obesity medicine. Special emphasis was placed on the mass spectrometric behavior of the new derivative and the parent molecule – sibutramine. The fragmentation routes for both compounds were established on the basis of HRMS measurements and results from B/E linked scan and mass spectrometry.

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Herbal Supplement, Weight Loss, N-Desmethylsibutramine

527 High Dose Sibutramine Detected in a Chinese Herbal Drug: A Case Report

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The goal of this presentation is to discuss the importance of herbal drugs, their safety, and their availability from the forensic toxicological perspective.

Traditional herbal remedies are used as alternative medicine by a large proportion of people worldwide. Herbal medicine is generally perceived as safe, harmless, and without side effects because of their natural origin. However, in the present case, a 36-year-old woman ordered a Chinese herbal medicine, called "LiDa Dai Dai Hua Jiao Nang" via the Internet. On the second day of taking the herbal medicine, she developed a severe headache, vertigo, dyspnea, arrhythmia and sleeplessness. After taking the product for ten days, the symptoms elevated and she was taken to the emergency room. Both a urine sample and a sample of the "LiDa" capsule were analyzed by GC-MS in the Forensic Toxicology Department.

Sibutramine was found in the urine at a concentration of 450ng/ml. Sibutramine was also identified later as the major ingredient in the "LiDa" capsule. Laboratory analysis revealed that each capsule contained 22 mg of sibutramine.

Although, many people use these drugs for weight loss purposes, this case demonstrates a common problem with herbal drugs. The sale of herbal drugs is forbidden in Turkish pharmacies or various drug stores. Yet these kinds of drugs are still available for purchase over the Internet.

Herbal Supplement, Sibutramine, Weight Loss

512 First Forensic Applications of the Dual Beam Technique SEM/FIB

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Conventional scanning electron microscopy (SEM) is an effective method for obtaining well-resolved morphological information regarding specimen surfaces. The identification of the elemental composition of even the smallest samples can be achieved by coupling SEM with an Energy-Dispersive x-ray spectrometer (EDS), leading to the combination SEM/EDS being well-established in forensic science laboratories for many years. Subsequently, the development of new devices has further broadened the applications of modern SEM. The present discussion is directed at the forensic uses of combining the electron beam of the SEM with a focused ion beam (FIB) in the same chamber, the SEM/FIB technique.

The value of the FIB is that it can sputter (remove) atoms from the surface of the material being studied. However, the ions are of the FIB, being larger and heavier than electrons, do not penetrate the material to nearly the extent that electrons do. The usual choice of ion for the FIB is Ga⁺ because because of its ability to achieve sputtering of all surfaces of interest. One of the great advantages of the FIB technique is that it provides different etching modes allowing the operator to choose the specific type of material to remove from the sample surface, and to make several passes in succession, removing a different type of material each time without destroying the sample itself. In preparing to use the technique with a sample, in addition to milling and etching of the surface, deposition of different materials like tungsten or platinum on the sample surface is often useful. Finally, the technique enables one to use special secondary ion imaging that shows excellent material and channeling contrasts, going beyond that offered by the SEM by itself.

The dual beam instrument used in the work to be reported is equipped with a high-resolution SEM and an energy-dispersive X-ray system for local elemental analysis. When the fine ion beam is working on a sample with dimensions of less than 10 nm, the subsurface region of the sample can be investigated by high-resolution SEM. The talk will focus in particular on studies of forensic relevance such as analysis of microprocessors, gunshot residues, modern paint pigments, textile fibres, and documents. For example, in microchips the technique can be used to expose selected conductor paths, and then to deposit highly conductive platinum or tungsten so as to create new connections between the conductor paths. This can, for example, allow the analyst to read otherwise hidden data from the memory chip. Shifting to another area, preparations of thin cross sections from paint layers will be presented and used to show how they permit much better lateral resolution for EDS analyses and how the FIB cross sections can provide morphological and chemical information about new pigments in car paints.

In summary, the technique enables the forensic expert to view and analyze objects with size in the range of few nanometers under the SEM while simultaneously working on them with the FIB. In this way, a precisely positioned three-dimensional view can be obtained of the interior structure of small forensic objects.

Dual Beam, Focused Ion Beam, New Forensic Application

226 Rupture of Cataguases Dam on 29 March 2003

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Ecological Accident

At 5 A.M. on Saturday, 29 March 2003, a confinement dam at a pulp and paper company in Cataguases (a town in the southeastern Brazilian State of Minas Gerais) ruptured, releasing 500,000,000 liters of water containing chemical waste (including sulphur, active chloride, and sodium sulphate) into Cágado brook and the Pomba and Paraíba do Sul Rivers.

The accident interrupted the water supply of more than 600,000 Brazilians distributed throughout eight different Brazilian cities: Campos dos Goytacazes, São João da Barra, São Fidélis, Cambuci, Itaocara, Aperibé, Santo Antônio de Pádua, and Miracema. Officials in those cities warned people not to drink from or bathe in the rivers affected by the spill. This prohibition remained in effect for 10 days following the accident.

A few days following the spill, the waste stream entered the Atlantic Ocean. On April 2, black water reached the coastal beaches of three cities in the State of Rio de Janeiro — São João da Barra, São Francisco de Itabapoana, and Campos dos Goytacazes — forced the official closure of those beaches, see Figure 1.

The rise in the pH of the affected river water killed hundreds of plants, animals, and fish. In addition, the use of the affected rivers for fishing and irrigation was prohibited for an extended period.

In the Atlantic Ocean near the mouth of the Paraíba do Sul River, fishing was forbidden for three months following the spill in order to minimize the possibility of contaminated-fish consumption. The government sought to mitigate the resulting hardship for the area's commercial fishermen by providing unemployment compensation for the period in question.



Figure 1 – Location of Cataguases, Minas Gerais Brazilian State.

Florestal Cataguases Ltda, the company that owned the ruptured enclosure, was subjected to a criminal investigation by the Brazilian Federal Police (Polícia Federal), the investigation being assigned docket number IPL 57/03-DPF.B/GOY/RJ. In addition, the accident was investigated by IBAMA (the Brazilian national environmental agency), the civil defense agency of Minas Gerais State, and the environmental agencies of the affected states.

The Polícia Federal (www.dpf.gov.br) investigates crimes against the federal government and its associated organs and companies. It is also responsible for combating international drug trafficking and terrorism and for overseeing the immigration and border-control police, including airport and water police.

Within the Polícia Federal, the technical-scientific unit (its title in Portuguese having the acronym DITEC) works through the National Criminalistics Institute (INC being the acronym in Portuguese) and the INC's state and local counterparts to fulfill its responsibility of developing and implementing forensic science techniques.

A Polícia Federal team composed of persons with specialties including but not limited to civil engineering, forestry, geology and chemistry visited the Florestal Cataguases Ltda dams in Cataguases in order to carry out two distinct studies: assessment of the total environmental damage and determination of the cause of the rupture.

The first work was directed at determining the dimensions of the ruptured dam (DAM-B, capacity: 453,000 m³), and the identification of its structural elements (spillway, crest, width, height, reservoir level, upstream face shape, downstream face shape, span and toe). This information is presented in Figure 2, which contains a cross section and plan view of the dam.

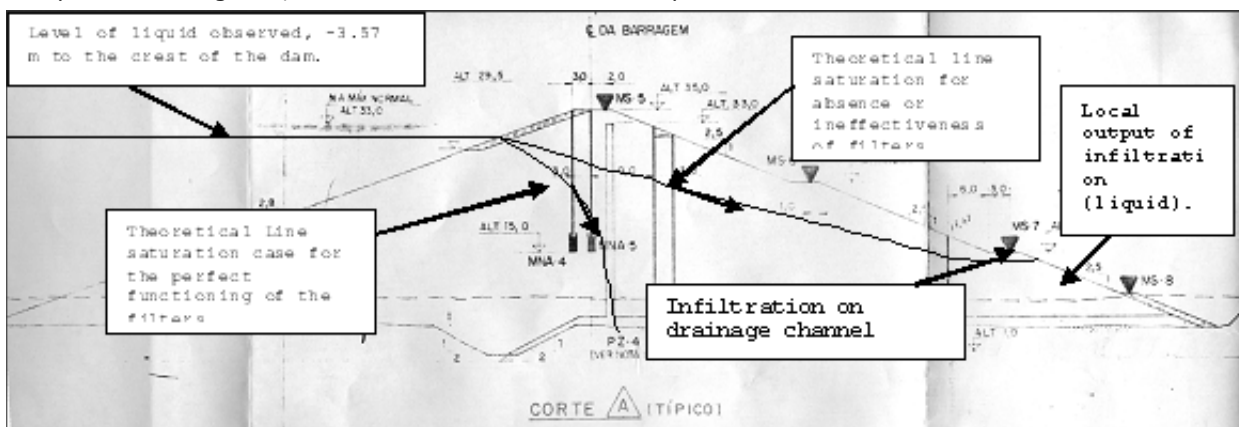


Figure 2 – Location of theoretical lines of saturation on the image of the section of the Dam project "B, which shows that the runny of liquid found (Photography 3) may be caused both by the infiltration and the piping.

In addition, the experts needed to identify any signs of soil erosion and drainage failures in the vicinity of the rupture. They looked in particular for "piping," which is the erosion of soil by water channels. Piping is frequently the source of the structural weakening that leads to failure of earthen dams.

The crime-scene search took place over 3 days during which erosion soil was found on the dam's downstream face, as well as damage to the drainage system around the reservoir and spillway. The investigation included the examination of a nearby, smaller dam (DAM-A, capacity: 180,000 m³) built to a similar design at about the same time that DAM-B was erected.

The investigation involved time-consuming scene photography and evidence logging, necessary to the determination of the dynamics and causes of the rupture. This work led to the conclusion that the risk of a new rupture was high.

DAM-B was built in 1989 and DAM-A in 1991. The safe life of this type of dam is considered to be 24 months, meaning that these dams were but a provisory solution for the industrial wastewater disposal and were intended to be replaced within two years at the most. However, the company that installed the dams (the Matarazzo Group) went bankrupt and the successor in ownership (Florestal Cataguases Ltda.) did not follow through with the replacement.

The engineers (from the Vector Engineering Company) who designed the dams for the original owners were worried about the risks of partial clogging of the internal system of filters in the case of percolating and saturation of the materials. The Polícia Federal investigation carried out by INC turned up a spillway failure on unruptured DAM-A. As a result the federal judicial authorities were notified for legal action against its owner.

The INC forensic investigating team consisting of Alan de Oliveira Lopes, João Luiz Moreira de Oliveira, and Silvio César Paulon identified faulty maintenance and control as the cause of the DAM-B rupture. Their first technical report on the subject (nº 1362/03-INC) set out the team's conclusions regarding the cause and dynamics of the rupture. This report was used in the criminal and civil legal processes that followed the investigation.

On May 23, 2003, based on the INC report, federal judge José Arthur Diniz Borges of Campos ordered the provisory arrest of the owners of Florestal Cataguases Ltda., a legal action taken in the course of an police investigation that appears to have uncovered wrongdoing. The owners were two Spanish nationals and one Brazilian. Though the defendants are still vulnerable to prison terms and/or fines, as of mid-2008, the criminal process has not reached an end point.

On the other hand, the civil process (nº 2005.51.03.001143-3) filed in federal court in Rio de Janeiro State concluded on 28 November 2007 with the judgment that the factory owners and other persons must pay a fine equivalent to approximately \$75,000,000 for the environmental damage caused by the DAM-B accident. This money is to be used by the appropriate government agencies to repair as much of the damage as possible and to compensate persons injured by the accident. This is a very significant outcome within the context of Brazilian environmental protection, being the largest fine assessed to date for negligently causing damage to the environment. Although the decision can be challenged in superior court, it nevertheless represents a giant advance in the treatment of environmental subjects in Brazil.

The possibility of future dam ruptures hangs over the Brazilian population. On 10 January 2006, after heavy rains, a dam holding back tailings from a bauxite mine in the state of Minas Gerais burst. Five thousand people were driven from their homes in the city of Cataguases, the same place harmed in the 2003 rupture.

It is essential that independent, objective, forensic specialists continue their work, regardless of frustrations they may feel at the lack of criminal prosecution that following work. It is hoped that the still-continuing results in the present case will give heart to those people. Their efforts underlie the integrity of the criminal justice systems in all countries.



Florestal Cataguases DAM-B, the rupture being visible on the right side



Cross section of Florestal Cataguases DAM-B, showing detail of sand filter



Soil erosion evidence on the downstream face of Florestal Cataguases DAM-B.

Engineering, Environmental Protection, Earthen Dam

41 Deformation of Electrical Conductors Caused by Short-Circuits

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It is important for fire investigators to find characteristic damage on electrical systems and equipment as the evidence of abnormal electrical activity. Some of the more common damages detected during the investigation, for example, are arc beads by short-circuits, oxide surfaces by poor connections, notched conductors by partial discharges, etc. However, it is generally difficult for all electrical components to survive the fire, making it necessary to examine the diverse kinds of characteristic damages.

At a fire scene, an electrical stranded copper cord of which conductors were deformed/warped was encountered. The deformation/warp was localized and the insulation was sporadically melted.

In this study, the cause of the deformation was examined along with whether the deformation was the characteristic damage resulting from the abnormal electrical activity relating to a fire origin.

To examine the cause, two types of currents were passed through PVC insulated electrical cords: short-circuit and overload. The goal of this presentation is to present the results of the experiments.

Fire, Electrical systems, Short-Circuit

Fingerprint Detection and Identification

83 A Long Afterglow Phosphor Powder for Fingerprint Detection

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Many types of fluorescence fingerprint powders or reagents are useful for the visualization of latent fingerprints deposited on multicolored surfaces that would present a contrast problem if developed with regular fingerprint powder. The developed fingerprints show bright fluorescence upon the exposure to laser, ultraviolet light and other light resources. However, these kinds of methods share a common concern, which is the surfaces of the substrates may fluoresce also. To solve this concern, a new long afterglow phosphor powder for fingerprint detection was studied. No special devices are needed it. Good results have been reported for the development of latent prints left on nonporous surfaces, as well as porous ones. The fluorescence afterglow can last several hours with recognizable intensity after the removal of excitation light. Lift and photography procedures of the developed fingerprints are also provided.

Afterglow, Phosphor, Fingerprint Detection

394 Ascorbic Acid Analogues as Reagents for the Detection of Latent Fingermarks - Analysis of the Reaction With Amino Acids

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A number of amino acid reagents have been proposed and developed for the visualization of latent fingermarks on porous surfaces. Ninhydrin, DFO, and 1,2-indanedione are the most commonly used compounds in this category. However, chemistry literature contains a number of additional reagents that could potentially be considered for further research.

The presenters' area of research involves dehydroascorbic acid, the oxidized form of ascorbic acid, which reacts with amino acid to produce a red colored compound. A similar reaction mechanism to the ninhydrin reagent. Given that no previous studies have considered ascorbic acid and analogues as fingermark reagents, research carried out in this project focused on optimizing the oxidation of ascorbic acid and analogues into their active form in the most appropriate solvent systems for this application. UV active species were monitored spectroscopically over time to determine the best method for oxidation.

Reactions are currently being studied in solution using amino acid impregnated cellulose. Results indicate a similar reaction to that of ninhydrin. Products formed and reaction parameters tested have been monitored and analyzed by electrospray ionization (ESI) LC-MS, nuclear magnetic resonance spectroscopy (NMR), ultra-violet absorbance (UV), and infrared absorbance (IR).

Fingerprint Detection, Ascorbic Acid, Ascorbic Acid Analogues

553 The Application of Anti-Stokes Luminescence for the Detection and Enhancement of Latent Fingermarks: A Preliminary Evaluation

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This study investigated the use of commercially available anti-Stokes materials, also known as up-converters, for the development of latent fingermarks on a range of nonporous surfaces. Anti-Stokes materials contain rare-earth complexes which absorb long wavelength illuminating radiation (e.g. near-infrared) and emit light at a shorter wavelength. This property is unusual in both natural surfaces and in consumer products, which means that fingermark detection techniques based on anti-Stokes luminescence are potentially extremely sensitive and selective.

Latent fingermarks were deposited on six non-luminescent and six luminescent substrates including Australian polymer banknotes and were developed with up-converters using a variety of techniques, including dry powdering, sticky-side powder, and cyanoacrylate fuming and staining. Results obtained using these up-converters were compared to those obtained using traditional reagents including black powder, stickyside powder, and Rhodamine 6G stain. This study illustrated the enormous potential of using up-converter phosphors for the detection of latent fingermarks. It was found that some traditional development techniques could be combined with commercially available up-converter powders with good results. A laser diode with 980 nm output was found to be effective in illuminating the developed fingermarks, and imaging the samples was relatively straightforward using a 700 nm low-pass filter.

Fingerprint Detection, Anti-Stokes Materials, Up-Converters

Fingerprint Detection and Identification

48 Preparation and Usage of a New Fingerprint Developing Membrane

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The fingerprint is one of the most important pieces of evidence found at the crime scene. When developing fingerprints, in most cases, the fingerprint on many kinds of objects are invisible. This leads to continual research in the areas of latent fingerprint developing methods. The traditional latent fingerprint developing method is the chemical processes. The popular developing chemicals are ninhydrin [1,2] and 1,8-diaza-9-fluorenone (DFO) [2-4]. The application of ninhydrin has been improved in many aspects such as with treatment of divalent metal ions [5], freeze-treatment with liquid nitrogen [6] and treatment with laser or visible light [7]. In 1995, a new fingerprint developing agent, 1, 2-Indanediones was reported by Jouille et al. [8].

Most of the previous studies focus either on the synthesis of the ninhydrin-similar chemicals or the post-treatment after latent fingerprint developing. With the improved methods the application sensitivity was increased. However, these methods are still limited to the porous items. It is important and necessary to research new methods to widen the application scopes, such as the development of latent fingerprints on non-porous objects.

In this work, a new series fingerprint developing membrane was prepared by using ninhydrin as the developing agent, and pressure-sensitive emulsifiers as the encapsulated chemicals. The type of the emulsifier, concentration of the developing agent and thickness of the membrane were studied in order to optimize fingerprint developing effects. The membrane can be successfully applied for both the latent sweat fingerprint and bloody fingerprint on many different objects. The sensitivity of the method towards the latent sweat fingerprint is 0.1mg/L amino acid, and that for latent blood fingerprint is 25% (v/v). The membrane can be applied not only to the porous objects, but also to the non-porous ones. Fingerprints that are difficult to visualize with the traditional chemical methods on the objects such as glass and heat-sensitive papers can be successfully developed with the membrane. This process is very simple and it can be used repeatedly.

Fingerprint Developing Membrane, Latent Fingerprint, Application

578 Diacetylene Copolymers for Fingerprint Development

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In 1979, Miller and Patel synthesized two diacetylenes, 2, 4-hexadiyn-1, 6-diol bis(phenylurethane) and 2, 4-hexadiyn-1, 6-diol bis(p-chlorophenylurethane) and demonstrated that a mixed acetone solution of the two compounds could be used to develop latent fingerprints. Diacetylenes are known to undergo topochemical polymerisation in the solid state, accelerated by heat, UV and gamma radiation. Miller and Patel found that their mixture crystallized on non-porous surfaces in two forms, an active form on clean surfaces that led to the formation of a dark red copolymer, and a white inactive form on greasy surfaces, such as the ridges of latent fingerprints.

The current work aimed to determine the potential for diacetylene copolymers as modern fingerprint reagents, since this application has not been further investigated since the work of Miller and Patel. In this new study, it was found, intriguingly, that two different types of fingerprint development occurred, one which resulted in white ridges on a purple background ("inactive development"), but also another that gave dark purple ridges on a pale pink background ("active development"). Another unexpected discovery was that the diacetylene mixture could be used to develop fingerprints on a number of porous and semi-porous surfaces (paper, cardboard, ceramic tiles, polymer banknotes), as well as non-porous surfaces. The technique showed high sensitivity in depletion studies and gave excellent ridge contrast in both types of development. However, the mechanism controlling the type of development that occurs is still unknown, and further work is needed to enable these phenomena to be properly controlled. In this presentation, the potential advantages and drawbacks of using diacetylene copolymers as fingerprint reagents on porous and non-porous surfaces will be discussed in detail.

¹ Miller, G. G. and Patel, G. N. (1979) *Journal of Applied Polymer Science*, **24**, 883-6

Fingerprint Reagent, Polymer, Diacetylene

623 Subsequent Chemical Treatment for the Enhancement of Latent Prints Developed with Silver Physical Developer

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Silver physical developer is one of the many chemical processes available for developing latent prints on porous surfaces. It does this by depositing silver particles onto the non-water soluble components of fingerprint residue. The amount of silver deposited is dependent on the amount of non-water soluble residue present. Therefore, developed latent prints vary in color from light gray to dark gray. Light gray prints can be visually optimized by turning into a darker gray with the application of a sodium hypochlorite solution.

Hypochlorite converts the silver (Ag) particles, which are present after the physical developer process, to silver oxide (Ag₂O) particles; this makes the particles darker and the overall latent print easier to visualize. However, a common occurrence with this chemical process is background interference from the porous surface. The interfering background is typically the printed material on the item (e.g. the

Fingerprint Detection and Identification

portraiture on the front of genuine currency). When the surface background and the developed latent print are of the same color, there is insufficient contrast to differentiate the background from the developed latent print.

This lecture will describe the general chemistry regarding a subsequent chemical treatment using potassium iodide to chemically darken the background and lighten the silver physically developed latent print. This enhances the contrast between the two to allow for the visualization of the latent print.

Latent Prints, Potassium Iodide, Silver Physical Developer

390 Mechanism Studies on the Indanedione-Zinc Reagent

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Indanedione and indanedione-zinc formulations have become routine techniques for latent fingermark enhancement due to the formation of both a colored and fluorescent product, without the need for post-treatment, when reacted with amino acids. While indanedione is a ninhydrin analogue that is thought to react via the same mechanism, little information is available in the literature to support this assumption.

The addition of Zn^{2+} has previously been shown to improve the indanedione-amino acid reaction, especially under conditions of low humidity. This study compared the reaction mechanisms of the indanedione and indanedione-zinc reagents with a variety of amino acids, as determined by Electrospray Ionisation Mass Spectrometry (ESI-MS), UV-visible spectrophotometry and solid-state Nuclear Magnetic Resonance (NMR). The results confirm the presumed indanedione reaction mechanism, particularly highlighting the role of Zn^{2+} in enhancing the indanedione-amino acid reaction.

A novel method of synthesizing the indanedione-amino acid product on a cellulose support was also trialed and optimized for this study. This method bypasses the difficulties associated with studying indanedione chemistries in solution which poorly reflect reactions actually occurring on paper.

Indanedione, Fingermark, Mechanism

128 Application of Functionalized Nanoparticles for Developing Latent Fingerprints

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Nanometer-sized fluorescent particles have been successfully synthesized in an aqueous solution by using mercaptoacetic acid as the stabilizer. The novel reagent was characterized by SEM and fluorescence spectroscopy as well as quantum yield and applied to latent fingerprints. The reagent could work in two ways, fluorescent method and super SPR. The process significantly improves the clarity of the developed prints compared with Rhodamine 6G or current TiO_2 SPR alone. Good contrast between the fingerprint and substrate is obtained.

Latent Fingerprints, Nanoparticles, Fluorescent Method

56 The Quantification of Fingerprint Quality Using a Relative Contrast Index

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Research into fingerprint enhancement techniques has traditionally used visual comparisons and qualitative methods to assess their effectiveness based on the quality of the developed fingerprint. However, with increasing research into the optimization of these techniques the need for a quantitative evaluative method has arisen. Parameters for acceptable fingerprint quality are not well defined and generally encompass clear, sharp edges and high levels of contrast between the fingerprint ridges and background material. Using these current parameters, a conclusive measurement of fingerprint quality and thus the effectiveness of development techniques cannot be achieved.

This study presents a model through which fingerprint quality can be objectively and impartially measured based on a relative contrast index, constructed through measuring the reflective intensity of the fingerprint ridges against the background material. Using a fiber-optic spectrophotometer attached to a microscope with axial illumination, the intensity counts of the ridge detail and background material were measured and a logarithmic contrast index constructed. The microscope and spectrophotometer parameters were experimentally tested using a standard color resolution chart with known reflective properties. The protocol was successfully applied to four sample groups:

Fingerprint Detection and Identification

black inked fingerprints on white paper; latent fingerprints on white paper developed separately with ninhydrin and physical developer; and fingerprints in blood deposited on white tiles and enhanced with amido black. The contrast indices obtained quantitatively reflect the level of contrast and the quality of the fingerprints through a numerical representation rather than previous qualitative methods. It has been suggested that the proposed method of fingerprint quantification may be viable for application in the forensic research arena as it allows the definitive measurement of contrast to aid the evaluation of fingerprint detection and enhancement techniques.

Fingerprints, Contrast, Spectrophotometer

324 Human Identification by Means of Sweat Pores

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The major objective of this research is to implement human identification through pore analysis in Colombia. The study of pore shape, size, and distribution is called poroscopy. This method supplements traditional fingerprint examination. Criminals have found a way to bypass the law through identity theft. Some of the most relevant cases detected by the Colombian authorities involve taking fingerprint impressions from documents, scanning those fingerprints, and then making stamps of the fingerprints. Criminals use biographical information of identity theft victims to carry out their criminal activities, such as bank fraud. In one case, the index finger of a dead person was amputated to collect pension benefits.

What can be done? Can fingerprints provide any additional information?

Since 2000, identity theft has become a frequent crime. There is no system currently available in Colombia to counter this type of activity. Therefore, the Colombian National Police has allocated resources to train its fingerprint analysts in the area of poroscopy.

In theory, a fingerprint fragment can provide a large amount of information. For example, the fingerprint examiner is able to determine whether a fingerprint was made directly by an individual or if a mechanical tool was used, e.g. a stamp, digital impression, etc. Additionally, pore distribution, size, and morphology can help determine if the fingerprint was produced by a living or a dead individual.

In Colombia, a relevant case was solved by a fingerprint analyst and medical examiner based on pore analysis. Consequently, fingerprint examiners should be capable of performing this type of analysis together with fingerprint examination.

To conclude, poroscopy is a fundamental identification method that supplements fingerprinting as a means to identify and individualize a person that steals someone else's identity.

This technique is widely accepted by the scientific community. Colombia has no history of using poroscopy as a human identification method. However, this technique has proven to be a reliable human identification method. Consequently, the Colombian National Police is planning on implementing its use.

Human Identification by Sweat Pores, Poreoscopy, Dactyloscopy

276 Development of a Digital Imaging Process for Indirect Latent Fingermark Comparison in Research

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When comparing aspects of a variable during fingermark detection research, the traditional method is to deposit latent fingermarks on the appropriate substrate and then cut the fingermarks down the centre. One half of each fingermark acts as a control (i.e. to be treated the same way or to remain untreated and stored under controlled conditions) and the other half used to examine the test conditions within the variable. When the experiment is complete, the two matching fingermark halves are juxtaposed and a direct assessment is made of which half displays superior development. Although this method allows the examiner to perform a direct comparison, it still relies on 'eyeball comparisons' which may be seen as subjective.

This paper evaluates several digital imaging processes and tools that can be used to compare latent fingermarks in this type of research. The models are assessed as a method of objectively measuring contrast in developed fingermarks. Are computerized measurements of contrast in digital images more objective and more useful than human assessment of the same images? Examples of application are presented and include research into the effect of temperature and humidity on fingermarks developed by ninhydrin, DFO, indanedione, and indanedione-zinc.

Fingermark, Digital Imaging Process, Objectivity

Fingerprint Detection and Identification

277 A Preliminary Evaluation of the Use of an Inkjet Printer to Produce a Latent Fingermark Standard

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One area identified for improvement in the fingerprint field concerns the quality assurance testing of reagents and techniques used to develop latent fingermarks before their use on actual casework items. At present, there is no universally accepted control fingermark that can be used to obtain objective results with respect to the relative performance of reagents and techniques. This presentation will highlight the next step in a series of tests aimed at developing such a control fingermark. A feasibility study has been undertaken to evaluate the ability of an inkjet printer to create reproducible latent fingermarks for use as a quality control standard. Results of this preliminary investigation are presented here, and recommendations for further testing are given.

Fingermarks, Inkjet printer, Quality Assurance

533 Digital Measuring Fingerprint and Palmprint Details: A New Technique of Digital Identification

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AFIS can compare fingerprints only through digital images of ridge ending and bifurcation. A new technique of digital measuring can allow comparison of fingerprint and palmprint details in several new dimensions. Further, two digital magnification scopes can be selected at two levels: 0 ~ 250x and fixed 500x. This hand-held digital device can also examine partial details for a comparison and it can be connected to a laptop and a projector for a live examination at the scene, in the DA's office and for the courtroom testimony. It is suggested that this new digital measuring technique will provide an additional capacity to forensic identification of trace evidence.

Digital Measuring, Fingerprint, Palmprint

88 Validation and Implementation of Probabilistic Based Fingerprint Evidence

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Recent challenges have highlighted the need for statistical research on fingerprint identification. Several United States and European organizations are currently funding and/or undertaking such research, leading to prototype systems for the statistical assessment of the evidential value of fingerprint comparisons in case work. These tools will change the way fingerprint evidence is viewed by criminal justice systems. Fingerprint examiners are raising concerns regarding this approach.

The presentation will focus on the model developed by the Forensic Science Service (UK) for the statistical evaluation of fingerprint comparison. The development of this model was started four years ago. For the past 18 months, this model has been validated with a view to report statistically fingerprint evidence in Court.

In this presentation, the development and the validation of this statistical model will be outlined. The various benefits and challenges that have been identified in the UK criminal justice system during field studies will be present and the presenters will engage the audience on their perspective of the application of this framework in their respective criminal justice system.

Fingerprint, Statistics, Likelihood Ratio Framework

136 GC-MS Method for the Analysis of the Lipid Composition in Fingerprint Residue using Derivatization

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The goal of this study was to establish a GC-MS method for the analysis of the lipid composition in fingerprint residue using derivatizing agents. The method utilizes methylene chloride and N, N-Dimethylformamide (1:1) as the extraction solution, heneicosane as the internal standard, and N-Methyl-N-(trimethylsilyl)trifluoroacetamide as the derivatizing agent. After a review of the recovery, the repeatability, the limit detection (0.5ng), and liner equation, it was determined that the method is satisfactory. The method is sensitive, simple, quick, and the derivatization occurs at room temperature. The potential application of this method will help in the analysis of the lipid composition of fingerprint residues.

Fingerprint, Derivatization, GC-MS

Fingerprint Detection and Identification

188 Development of Oily-Rich Latent Fingerprints on the Adhesive Side of Black Electrical Tape Using Nano Titanium Dioxide (TiO₂) in Small Particle Reagent

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The goal of this presentation was to study the effect of a small particle reagent, TiO₂, on the development of oily-rich fingerprints located on the sticky side of black electrical tape. During this study many different factors, including the species and concentration of surfactant, the concentration of TiO₂, and pH value, were explored to obtain the best result. The study found that it was possible to develop the oily-rich fingerprints on the sticky side of black electrical tape, which had been left for two months and kept in water for four days, by TiO₂ reagent when 0.2mg/mL of sodium dodecyl sulfate (SDS) and 10mg/mL of TiO₂ were used at a pH of 7. The researchers conclude that the small particle reagent, TiO₂, can develop the oily-rich fingerprints on the sticky side of black electrical tape.

Oily-Fingerprint, Nano Titanium Dioxide, Development

249 Fingerprint Components Emitting Ultraviolet Fluorescence Excited With an Ultraviolet Pulsed Laser

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Literature supports the non-destructive visualization of latent fingerprints using a tunable ultraviolet laser without chemical treatment. The researchers previously reported that the fluorescence intensity was maximized at 280nm in the excitation wavelength region ranging of 220nm to 310nm. The clearest fingerprint image was also obtained at a wavelength of 280nm. However, the fingerprint components contributing to the ultraviolet fluorescence have not been identified. Therefore, the goal of this study was to examine the fluorescence characteristics of many of the amino acids found in fingerprint residues.

The fluorescence spectra of 20 amino acids were obtained using a fluorescence spectrometer. Several amino acids were found to fluoresce. Furthermore, some of the amino acids were found to fluoresce at the excitation range of 270-290nm and showed similar fluorescence characteristics as those of fingerprints. The fluorescence lifetime of these amino acids was measured using a pulsed laser and estimated as approximately two - four nanoseconds, which is similar to that of fingerprints. The findings suggest that amino acids are major contributors in fingerprint fluorescence.

Fingerprint, Fluorescence, Laser

310 Effect of Substrate and Development Method on Visibility of Sweat Pores in Latent Fingerprints: A Preliminary Study

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Edmond Locard proposed poroscopy as one of the means of personal identification from fingerprints and, subsequently, incorporated this knowledge in solving a case. However, this method of personal identification is not being used extensively and is not being used with the same zeal as ridge characteristics. The main reasons for this hesitancy have been mentioned in the literature as the non-availability of sufficient published information on this aspect as well as the reluctance to use microscopic methods with fingerprints. With the availability of new image processing technologies, it is possible to overcome the difficulty of microscopy and therefore, once again, poroscopy is in the news due to its possible use in Biometric methods. Unfortunately, there is no study available reporting the possible effects of surface on latent fingerprints and the method by which latent fingerprints have been developed. In the present work, pores of latent fingerprints were observed after being developed with black powder, iodine fuming, ninhydrin, small particle reagent (SPR) and cyanoacrylate fuming (Super Glue) on different types of substrates. The study reports the variations found in the observed pores.

Latent Fingerprints, Sweat Pores, Poroscopy

Fingerprint Detection and Identification

311 Development of Latent Fingerprints on Photographic Film

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Latent fingerprints can be found on any type of surface and various methods are available to develop them. However, some surfaces are unusual, making the development of fingerprints quite tedious in some instances. The present study focuses on one such surface, photographic film. Latent fingerprints were impinged on both color and black and white films were developed with different standard methods. The interaction of the various reagents on each film surface was studied. The effect of time on the development of latent fingerprints was also studied by keeping the films in ambient conditions for different intervals ranging from one to 12 days.

Latent Fingerprints, Photographic Film, Aged Prints

313 Small Particle Reagent: Development of Fluorescent Variants

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The application of small particle reagent (SPR) is widely used for the development of latent fingerprints on nonporous and wet surfaces. Conventionally, molybdenum disulfide based SPR has been used for the development of latent fingerprints, but some SPRs based on other materials, such as charcoal powder, zinc carbonate and titanium dioxide, have been reported. Fluorescent preparations of molybdenum disulfide based SPR have also been reported previously. In the present work, a number of SPRs based on zinc carbonate have been developed in combination with various fluorescent dyes to develop latent fingerprints on a number of non-porous surfaces. The quality of the developed fingerprints was evaluated and the results are reproducible. The shelf life of each developed reagent was long and the results are discussed in this study. The immersion time required for latent fingerprint development on the substrate with the various reagents was also examined.

Latent Fingerprints, Small Particle Reagent, Fluorescence

314 A Dermatoglyphic Study in Cases of Polydactyly and Syndactyly

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Dating as far back as prehistoric times, ridged surfaces on the palms and soles have always been a subject of curiosity for man. More recently, early 20th century studies established the use of these particular areas of the human body, not only for personal identification, but also in the field of evolution, medicine, and genetics. Certain types of genes primarily control the dermal ridges, which are developed during the intrauterine period. However, the intrauterine environment is largely responsible for the final representations of that area. Certain genetic factors causing distortions in palms and soles may also cause deviation in the ridges, which may need the special attention of scientists. Very little work on this aspect of dermatoglyphic development has been reported in scientific literature and therefore, an attempt has been made to study the dermatoglyphic distortions, if any, in persons having polydactyly, syndactyly, and polysyndactyly.

The sample size of the present study is small but the results are very interesting as well as encouraging. The researchers would consider it a privilege to extend this study further for more details.

Dermatoglyphics, Polydactyly, Syndactyly

338 The Comparative Research on the Development of Bloody Latent Fingerprints on Adhesive Tape

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Bloody fingerprints left at crime scenes have been the focus of analysts worldwide. In China, the development of bloody fingerprints found at the crime scene is often confined to the use of Tetramethylbenzidine (TMB). Since the crime scene situation is constantly changing, it is believed that a wider range of choices for developing reagents is necessary. In this study, adhesive tape was used as the substrate and the reagents used were TMB, Amido Black 10B, leucomalachite green (LMG) and Coomassie Brilliant Blue. Each reagent was used on the substrate in order to compare the development of bloody latent fingerprints on adhesive tapes.

Adhesive Tape, Bloody Latent Fingerprints, Development

Fingerprint Detection and Identification

570 The Effect on the Fingerprint Developing Results by Different Solvents of DFO

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Methanol and ethanol are the most commonly used solvents in the formulation of DFO. The principal aim of this research is to find out how these two solvents affect the fingerprint development.

Six kinds of porous objects are chosen for this experiment, using the methanol solvent of DFO and the ethanol solvent of DFO to develop the latent fingerprints respectively, then, under the multi band-light, we estimate the quality, quantity, applicability and other features of the fingerprints that are developed by these two solvents.

The result of methanol solvent is better than the ethanol solvent. Methanol solvent has a wider applicability, it can improve the quality of the developed fingerprint, but the methanol also contaminates the object for its polarity, and the toxicity will hurt the operator. Comparatively, ethanol has a lower toxicity and lower polarity, but the quantity of the developed fingerprint is fewer too.

In addition, to testify the affection of the solvent, two kinds of DFO crystals are putted into intercross examination with the methanol solvent and the ethanol solvent, and then the rule of how these two solvents affect the result of the development of the latent fingerprints will not change.

Effect, Solvent, DFO

571 Latent Fingerprint Development by Lanthanide Luminescence

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Fluorescence plays a significant role in fingerprint detection when conventional chemical enhancement methods fail. The basic properties of fluorescence emission, such as color, intensity, and lifetime, could be exploited in the detection of latent fingerprints. The resulting fluorescent lifetime is significant when a print is deposited on a fluorescing background and its emission wavelength is close to that of treated fingerprint. This paper proposes a new method using lanthanide luminescence to develop latent fingerprints. In order to allow time-resolved imaging to reveal fingerprint ridges on strongly fluorescent surfaces, a modulated argon-ion laser near-ultraviolet (UV) light was used to excite emission.

In this study, EDTA, TTA, and OP are used as ligands to form the complexes. The lanthanide ion selected was europium (Eu³⁺) because it has the strongest luminescence. Fingerprints were stained by the organic ligand and the europium ion (Eu³⁺) provided strong luminescence via intermolecular energy transfer with the ligand.

Fingerprints were deposited on various surfaces (for example, cardboard, paint, wood, plastics, and magazine paper) and then treated with various solutions. First, one part of Eu³⁺ and four parts of EDTA were dissolved in 100 ml of acetone (Solution 1). Next, 75 mg of europium chloride hexahydrate (EuCl₃•6H₂O) and 500 mg of EDTA (to saturation) were dissolved in 100 ml of acetone and this solution was slowly added to the first one. The resulting solution was lightly sprayed onto fingerprints (fresh prints on magazine paper, cardboard, wood, and plastics) using a chromatographic sprayer. After two minutes, prints were sprayed with a solution that was prepared by dissolving 75 mg of OP in 100 ml of acetone. Finally, prints were sprayed for a third time with a solution prepared by dissolving 45 mg TTA in 100 ml of acetone. After a few minutes, the fingerprints were examined for luminescence. This examination used an argon-ion-laser operating in the near-UV to suppress background fluorescence. Excitation and emission spectra were measured directly on a treated fingerprint (on a glass slide) using a LS-50 spectrofluorimeter (Perkin Elmer). Lifetime measurements were taken using standard boxcar averaging techniques.

A novel time-resolved imaging system was designed in this research. This system is made with an argon-ion-laser, a light chopper, a computer, and a CCD digital camera. The camera photographed fingerprints flexibly and processed the images obtained by this system. Because Eu³⁺ has a luminescence lifetime of 0.4ms, the light chopper operates at 650Hz. The liquid light guide transmitted the chopped beam to illuminate the subjects. A liquid light guide was used instead of an optical fiber because the diameter of the liquid light guide is big and can transmit visible light and ultraviolet effectively. The imaging employed a gated proximity-focused image intensifier and the images observed on the phosphor screen of the image intensifier were photographed as part of this study.

Latent Fingerprint, Lanthanide Luminescence, Time-Resolved Imaging

580 Research on Photography of Latent Fingerprints by Inherent Fluorescence at Low Temperatures

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Having the most application in the investigation of crime scenes, fingerprints are used as evidence to reveal, to substantiate the crime, and to discriminate suspects. Since the majority of the fingerprints left at crime scenes are latent, the research on the development of latent fingerprints has attracted great interests for a long time. This paper presents the approach of developing latent fingerprints without damage through the use of inherent fluorescence photography at low temperatures.

Fingerprint Detection and Identification

The focus of this study was the use of fluorescence techniques on three different types of fingerprints: blood, sweat, and grease. Peanut oil, motor oil, soybean salad, transformer oil, and butter were used for the materials in the experiment of grease fingerprints. Liquid nitrogen was used to lower the temperature and the excitation caused by the use of ultraviolet light was photographed using a CCD camera. Blood fingerprints and sweat fingerprints are generally not capable of emitting fluorescence at room temperatures, while at low temperatures, both emit fluorescence and better photos are obtained. Peanut oil, soybean salad, and butter emit weak fluorescence. However, the mineral oils, motor and transformer, can emit strong fluorescence, making photography possible.

Latent Fingerprint, Inherent Fluorescence, Low Temperature

582 Research on Tape Stripping and the Optical Development of Fingerprints on the Sticky Side of Tape

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Tape is being used more and more in many criminal activities, especially in the rising incidence of kidnapping, robbery, fraud, rape, and bombing cases. As a result, tapes that twine mutually are often left behind at these types of crime scenes. Use of the effective method of stripping the tapes that twine mutually is the foundation of the development of fingerprints on the sticky side of tape. Optical development of fingerprints on the sticky side of tape has great significance in the detection and examination of latent prints and the subsequent identification of suspects. Method: In this article physical and chemical methods were used to strip the tapes. Then conventional photography and short wave ultraviolet reflex photography were used for the optical development of fingerprints on the sticky side of the successfully stripped tape. Results: The friction ridges developed by the method of short wave ultraviolet reflex photography were clear, continuous, rich, and of high contrast. Moreover, this method was easy to operate and it was able to nondestructively develop and fix the fingerprints on some kinds of tapes without brushing and dying.

Sticky Side of Tape, Short Wave Ultraviolet, Fingerprints

480 Comparing Two Methods of Analysis: Application of Factorial Design to the Evaluation of Modified Griess Test

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Factorial Design is a mathematical tool which enables the evaluation and optimization of information obtained for a certain phenomena with a minimum of experimental runs. In this study the comparison of two different azo-dye producers were performed analyzing the effect of the following parameters on the quality of the colored product of the Modified Griess Test: type of firearm (revolver:semiautomatic pistol), firing range (4:12 inches), azo-dye precursor (alpha-naphthylamine:p-nitro-aniline) and time of impregnation of the photographic paper (immediate use:1 day of impregnation). The results observed were defined in three different ways, named as "Approximate area" (AA), "Exact area" (EA) and "Cumulative relative intensity" (RI), with the second function the best behavior to be analyzed. According to these results, the most influential factor over the quality of the analysis is the aging of the paper substrate; followed by the identity of the mine precursor, the firing range and finally the kind of weapon. Through this methodology the different methods of analysis can be judged and evaluated.

Factorial Design, Griess Test, Linear Regression

657 Determination of Direction of Shot by the Presence of One Bullet Track on a Barrier

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The establishment of the circumstances surrounding firearms incidents is one of the most arduous and difficult tasks in the area of firearms examination.

As practice shows, in many such cases, the firearms expert may have to decide questions in close touch with experts of other professions. Two case examples are offered. In both cases it was necessary to determine direction of fire from one track of a bullet from the firearm.

1. Circumstances of crime: according to a witness, an armed man in a mask burst into an apartment and fired at citizen N. with a pistol while standing at the threshold of a door, the weapon in a stretched hand at shoulder level (approximately at a height of 1500 mm from the threshold of the door). At the moment of the shot, the victim was sitting on the floor watching television and the witness was sitting on a sofa, located near a wall by an entrance door.

The victim died at the crime scene. An examination of the site of occurrence revealed the track from a bullet on an opposite wall from an entrance door and an oval track of blood on the wooden floor with a minimum diameter of 114mm and a maximal diameter of 153 mm. The firearm in the case was a Makarov 9 mm. pistol. Medico-legal experts determined the site of the wound and direction of travel through the body.

Determination of the direction of fire was necessary for verification of witness testimonies.

In this case, one track from a bullet on a wall does not suffice to determine direction of fire. It is necessary to set a minimum of two points for determining the line of fire and establishment of direction.

By studying the track of blood at the crime scene, the location of the victim can be confirmed at the moment of shot. The exact three-dimensional co-ordinates of the track of the bullet can be set on the second barrier – the wall. Based on the conclusions of the medico-legal expert, three-dimensional co-ordinates can be calculated within possible limits for the "track on the first barrier". Taking into account that a victim sat on the floor at the moment of the shot, and received a wound in the area of the neck, by measuring the distance from the coccyx of body to the wound in area of neck (1030 mm.) and taking into account the body features the victim, his clothes, and distance from the floor to the place of wound equals 1090 mm., a line of shot can be calculated. It was determined that the shot was fired from the threshold of door, but on height of 246 mm. Thus our conclusion conflicted with witness testimonies. In the future a witness changed their testimony and confessed his guilt: as a result of not carefully handling the firearm, when he sat on a sofa a mortal shot happened. Our information fully coincided with this testimony.

2. Circumstances of crime: A shot was fired from a 12-gauge shotgun into a Jeep, killing the victim who was behind the wheel. A firearm was passed from a passenger sitting ahead, back to the passenger to sitting behind him. An examination of the car revealed the following firearm damage: damage to the left front window, damage on the left front lateral bar of the roof, damage on the lower surface of the left sun-protector, damage on the ceiling. All damages are fixed in the three-dimensional measuring. Medico-legal experts set the site of the wound and direction of fire on the deceased.

This case presents several problems:

- a shotgun produces a spread of shot, and only 4 shot of 13total was found at the scene;
- the location of head of the victim at the moment of shot from the specific terms of ride did not appear to represent in the three-dimensional measuring;
- different testimonies of two witnesses of this incident.

Firearm/Toolmark Examination and Identification

Decision: A plan for conducting of research was worked out in the following manner:

a) it was first required to set the complete picture of the spread on the basis of four pellets, after to define its center and accept it as "track on the second barrier" from the firearm;

b) taking into account the size of weapon, internal location of seats et al and interior of machine, conclusion of medico-legal examination, and also builds of body of all of three persons and testimonies of two witnesses to consider and define all of possible mutually arrangement of weapon and victims, that will allow to define "track on the first barrier";

c) to confront the center of the spread of shot and all of possible locations of weapon taking into account the injury on the head of dead body, how are two points, through which it is possible to conduct the line of shot and on that ground to suppose direction of shot.

Decision:

a) A mathematical model of shot spread is a group of points on an object, located round a certain center. However as at the moment of shot the front left window was opened, it is possible to suppose that basic part of shell was out of car. Based on this, we conducted a series of experiments. Shots were fired from the weapon in different biomaterials with the purpose of finding a similar pattern of injury to that of the deceased. Then the experimental biomaterial was set to simulate various portions of the Jeep; the distance from biomaterial to the shield chosen middle among possible distances from the head of victim to the driving door. In addition, the weapon was fired from a distance of 10 mm. in accordance with the conclusions of the medico-legal examination. The firearm was fired from safe distance by a rope operating on a trigger hook.

Conducting 7 experiments gave the steady picture of the spread of shot on a shield. Defining its sizes and form we on the basis of having tracks from 4 pellets in the interior of the Jeep confronted and made the optimum center of talus of shot "on the second barrier" and one of two necessary points for determination of line of shot.

b) Taking into account the injury pattern, its direction, all of possible distances between the door, the head of the victim and weapon, a possible location of weapon inside the Jeep (taking into account for limitations possibility of manipulation of weapon in space of the interior of the machine), set by us possible position of head of victim in the moment of shot. The same got "track of shell on the first barrier" - the second point for conducting of line of shot.

c) In the total conducting a line through two points, defined possible direction of weapon in the moment of shot.

Our research helped to come to the followings conclusions:

- at the reception-transmission of the weapon from a front passenger seat to back achievement of area of his trigger hook is possible by both passengers;
- to make the transmission of weapon from a front driving seat to the back seat, here arriving at area of trigger hook of weapon by a person, sitting it is impossible on a driving place.

Track, Shell, Barrier

535 Digital Measuring Rifling Angle: A New Technique of Digital Identification

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Integrated Ballistics Identification System (IBIS) compares expended bullets and cartridge casings only through digital microscopic images. A new technique of digital measuring can allow a comparison of bullet and casing details in several new dimensions, including the angle of rifling lines. Further, two digital magnification scopes can be selected at two levels: 0 ~ 250x and fixed 500x. In addition, this hand-held digital device can examine even fragmented bullets and casings for comparison purposes. Finally, this new device can be connected to a laptop and a projector for a live examination at the scene, in the DA's office and for the courtroom testimony. It is suggested that this new digital measuring technique will provide an additional capacity to forensic identification of firearm evidence.

Digital Measuring, Bullets and Casings, Firearms Identification

555 Laser Ablation ICP-MS of Metal Particles Generated From the Illicit Removal of Firearm Serial Numbers

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The suitability of Laser Ablation as a sample introduction technique for analysis of firearm steels by ICP-MS was assessed. The steel swarfs were generated by the manual obliteration of firearm serial numbers using the process of drilling which is often employed once a firearm reaches the black market. In the context of forensic science, the capability to compare metals of known and unknown origin would provide improved traceability when firearms are diverted from the licit to illicit markets. The inherent variability in the elemental composition of different steels lends itself to "chemical fingerprinting."

Firearm/Toolmark Examination and Identification

The study was performed on a UP213 Series Nd:YAG Laser and Agilent 7500 ICP-MS. Initially, twenty-eight isotopes were monitored however only ten were found to be suitable – ^{47}Ti , ^{51}V , ^{52}Cr , ^{55}Mn , ^{59}Co , ^{60}Ni , ^{63}Cu , ^{75}As , ^{95}Mo and ^{121}Sb . A quantification study of standard steel SRM361 against standard glass NIST612 was performed to assess the accuracy of the LA-ICP-MS technique. The ten isotopes of interest were quantified in the range of 82-129% of the standards values expected. When analyzing the 86 firearm samples, the metal swarf was compressed and subjected to a series of ten laser shots to ensure representative sampling of the material. ^{57}Fe was employed as the internal standard to account for fluctuations in the amount of sample ablated. %RSDs were generally between 1-8% for all 10 isotopes. To demonstrate the inhomogeneities present in the swarf samples, samples were also mapped and images produced with ENVI software. The data for each of the 86 firearm samples was normalized and then subjected to chemometric modeling, using Principal Component Analysis, Hierarchical Cluster Analysis, and Linear Discriminant Analysis.

The technique proved successful for the classification of samples from different manufacturers and the majority of different models via inter-elemental pattern association. The suitability of LA-ICP-MS was ultimately tested through comparison with previous studies on the same samples using $\mu\text{-XRF/SEM-EDX}$ and solution ICP-MS.

Firearm Serial Numbers Removal, Chemical Profiling, Laser Ablation ICP-MS

193 Reproducibility of Ejector Marking on Expended Cartridge Cases

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Outline of Objectives: Ejector markings impressed on center fire cartridge cases are used for identification of firearms and estimation of the type and make of firearms from which the cartridge cases are loaded and fired. However the reproducibility of ejector marking is low compared with that of firing pin or breech face markings. The purpose of this study is to numerically evaluate the reproducibility of ejector marking.

Firing pin and breech face markings are impressed on cartridge cases when the cartridge is locked in the chamber. On the other hand, ejector markings are impressed on cartridge cases during the extracting process of cases. Reproducibility of ejector marking is reduced because of this impressing process.

Brief Methodology: Size and position of ejector markings were measured on the image of expended cartridge cases. As the ejector markings are usually complicated in shape, it is difficult to evaluate the fluctuation of the shape and position of ejector markings in a simple manner. In this study, Japanese Type 14 and Type 94 semi-automatic pistols were selected for analysis because their ejector and ejector aperture shape and position is simple - that is, rectangular in shape and 6 o'clock in position.

Summary of Results: Size and position of ejector markings fired from the same make of firearms varied much from one to another. This result indicates that size and/or position of ejector markings will play key role in identification of marking. On the other hand, size and position of ejector markings fired from the same firearms varied from fire to fire to some extent. This result indicates that difference in size and/or position of ejector markings in some extent will not lead to negative identification conclusion. The position especially fluctuates between cartridge cases fired from the same firearm. As depth of ejector markings varied from fire to fire, three-dimensional analysis may not be effective for ejector identification. Even if the size and position is different, individual characteristic sometimes appeared in restricted area in ejector marking.

Ejector Marking, Reproducibility, Cartridge Case

696 The Identification of Bullets Fired From Ten Consecutively Rifled 9mm Pistol Barrels: A Research Project Involving 446 Forensic Scientists From Forensic Science Laboratories in 18 Countries

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Ten consecutively rifled Ruger P-85 pistol barrels were obtained and then test fired to produce known test bullets and 'unknown' bullet for comparison by firearms examiners from around the world. This study is a continuation of one originally designed and reported on by David Brundage – then the Firearms Training Coordinator for the Illinois State Police. The original study was limited to examiners from nationally accredited laboratories and we wanted to expand the study to provide test sets for firearms examiners around the world. The Ruger P-85 pistol, and the 10 consecutively rifle barrels were borrowed from the Illinois State Police ammunition obtained from Winchester Ammunition Company, and 240 sets produced and distributed.

To date, some 441 examiners from 18 countries worldwide have examined the bullet test sets. Every examiner used conventional optical microscopy to conduct their examinations and reported their findings. An additional five examiners used various ballistics imaging systems to evaluate the bullet test sets. An error rate was developed and will be discussed during the presentation.

Consecutive Barrels, Daubert, Known Non-Match

195 Age Estimation With Limb Joint Radiographs in Chinese Living Teenagers

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Scientific age estimation of an individual by forensic expert plays a great role both in civil and criminal cases in many countries. Whether a juvenile offender had reached the age of criminal responsibility at the time of the offence is often demanded by the court. In 2002, the Supreme People's Procuratorate of P.R.C. confirmed that bone age assessment can be used as court evidence. Thereafter, as the criterion for forensic age estimation of living subjects, bone age assessment had attained great attentions and been applied in many forensic institutions. However, a same individual case may get different assessment results in lack of a scientific and unified criterion or method. As a result, the accuracy and reliability of bone age assessment are widely questioned. In order to standardize the heterogeneous procedure in setting up expert reports and to implement quality assurance in this area, a scientific and unified criterion or method is urgently needed. In this paper, a systematic observation and analysis of bone age indexes (morphologic changes of punctum ossificationis and epiphyses) in teenagers aged between 11.0 and 20.0 years were provided.

The objective of the present study was to observe skeletal development maturity of sternoclavicular joint, shoulder, elbow, hand-carpal, hip, knee, and ankle joint in teenagers of Chinese and then selected 24 significant epiphyses as growth in sexes. In addition, height, weight, and location are all considered followed by the investigation of the relationship between every index and chronological age. In this way, a foundation could be established for formulating unified methods or criteria of forensic age estimation in living teenagers. At last, a standard method was discovered by which the chronological age of Chinese teenagers with extremity articulation radiograph could be estimated.

From Henan, Hainan, and Zhejiang Province 1,897 teenagers between the age of 11- and 20-years-old (, with 838 girls and 1,059 boys respectively) were subjected to this study by stratified sampling method. Sample entrance and exclusion criteria was established. The study was made in accordance with the standards of the Faculty of Medicine Ethical Committee and informed consent was obtained from all subjects. After measuring height and weight, antero-posterior and lateral X-ray projections were taken for each joint. By using X-ray equipment with a tube current from 200 mA to 500mA and voltage from 80kV to 100kV, 13,279 valid radiographs were obtained from all the subjects. From the sternal end of the clavicle and the left side of the shoulder, elbow, carpal, hip, knee and ankle joints, 24 osteal loci were selected as bone age indexes. Height, weight, and location are also considered as study indexes. By observing the morphologic changes of punctum ossificationis and osteoepiphysis, ossification stages of the 24 osteal loci were classified in accordance with the staging system proposed by Tanner J.M and Whitehouse. The stage value of the 24 bone age indexes ranging from two stages at least and eight stages at most was determined. All stage classifications were set by the consensus of two radiography professors and two post-graduates with experience in the radiological staging of bone age indexes through MIWORKS 5.0.0.6 PACS radiography software. The consistency of the results was checked, and Kappa ratios are 0.76, 0.73, 0.72, 0.78. All statistic procedures were done by SAS 8.1 and SPSS 11.0 software package with significant level at 0.05 for both sides. Relationship between each bone age index, height, weight and chronological age had been probed by the Pearson Correlation procedure. Calculated the age interval of ossification centre appeared and epiphysis arrested time of male and female teenagers. In order to get the optimal model fitting relationship between the ossification stages of the 24 osteal loci and chronological age; proc nlin procedure, multi-regression, cluster analysis, and Fisher's linear discriminant method were used. All procedures had been done separately for each gender.

For both sexes, each index had moderate correlation to chronological age ($p < 0.001$, $R > 0.6$) except for X6, X7, Height, Weight ($p > 0.05$, $R < 0.6$). For males, the indexes with high correlation to chronological age are X1, X2, X4, X8, X9, X13, X15, X16, X22, X23 ($p < 0.001$, $R > 0.8$). For females, the indexes are X1, X2, X4, X8, X9, X15, X16, X22 ($p < 0.001$, $R > 0.8$). However, compared with the data of 1950s' and 1960s', skeletal development of Chinese teenagers has accelerated. The current research data demonstrates that the time metacarpa and phalanges epiphysis is arrested completely in male and female subjects has advanced to 16 and 15 years respectively. The time of sternal end of clavicle punctum ossificationis secundarium appearance of males and females has advanced to 15~19 years and 16~18 years. The age of iliac crest epiphysis arrest of males and females are about at 18~20 years and 17~20 years. Compared to the previous data, it's obviously that the developmental age advanced by 2~3 years, and this result is confirmed to Gu G.'s study. Several mathematical models of estimating chronological age from these bone age indexes had been established. The best multiple regression equation for male and female is respectively: $Y_m = 7.673 + 0.015 * \text{Height} + 0.450 * X_1 + 0.153 * X_2 + 0.364 * X_3 + 0.170 * X_4 + 0.215 * X_6 + 0.332 * X_9 + 0.219 * X_{15}$ and $Y_f = 9.414 + 0.462 * X_1 + 0.182 * X_2 + 0.493 * X_3 + 0.226 * X_4 + 0.304 * X_8 + 0.184 * X_{15} + 0.096 * X_{16}$. The prediction error of males limited in ± 1.0 years and ± 1.5 years are 70.59% and 88.24%, while that of female are 78.46% and 93.85% respectively. Adj-R² of the two equations of male and female is 0.8245 and 0.8141. By analysis of variance, $F > 0.01$, the regression is very significant. The equation has practical value. As is showed in this study, there are 12 discriminant equations established to determine whether a subject had reached the physiological key age of 14, 16 and 18 years old. Each age group has two equations. In addition, the synthetic discriminant rate of discriminant equations was given to determine age of 14, 16, and 18 years of each gender. The highest synthetic discriminant rate of male and female for training samples is 86.6% and 87.4% respectively for checking samples is both 100%. However, the synthetic discriminant rate for training samples of discriminant equations to determine age of 14, 16, and 18 is lower than Tian X.'s report. Perhaps, the synthetic discriminant rate of the authors' study is the three districts simultaneous while Tian X.'s is only for one district. Therefore, the degression of the rate perhaps correlates to developing disparity of different districts.

Based on a larger sample of Chinese teenagers for each gender, the updated age estimation criteria of living subjects by observing the morphologic change of punctum ossificationis and osteoepiphysis in this study could be more practical and scientific for forensic experts. With these updated criteria, the reliability and accuracy of bone age assessment could be improved greatly. The mathematical models proposed in this study have provided new methods to current forensic age estimation, but practical verification is still needed.

Age Estimation, X-Ray Plate, Living Subjects

544 An Investigation Into the Individuality of the Human External Ear Pattern: Its Application in the Field of Personal Identification

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Establishing the identity of unknown persons continues to pose a challenge to the forensic expert. With the advent of sophisticated modern electronics to monitor and prevent crime the topic has become even more relevant. The field of biometrics and the identification of an individual makes use of human characteristics, such as hand geometry, iris scan, gait, and facial features. Ear biometrics is a new entrant in this field.

The question of reliability and applicability of many biometric characteristics as evidence in court has not been fully resolved. Over the years, suggestions have been made in the literature that the shape and characteristics of the human external ear vary widely and may be in fact sufficiently variable that it is possible to differentiate between the ears of all individuals. Though attempts had been made in the past, this "individuality" has not been empirically established. The present study inquires into this problem using several characteristics of the human external ear for the purpose of exploring its use in profile view facial image recognition.

The study was conducted in Saugor University on six hundred and ninety individuals. A digital Photo-anthropometric tool has been devised to make a faithful comparison between images of different ear patterns. Profile images were digitally processed and ten anatomical landmarks were identified on them. A seventeen dimensional feature space was constructed and a comparison made measuring the Euclidean distance between pairs of ear patterns. The distribution of such distances for a large sample size will give a quantitative indication of the nature of variations of ear patterns among different persons. This will shed light on the individuality of human ear patterns.

Ear patterns of all individuals were found to occupy a unique position in the seventeen dimensional feature space. The most interesting outcome of the study is testing the similarity between left and right ears of same person. Though both the ears belonged to the same individual, neither of them were exactly alike and thus maintained their individuality.

The results of the present study strengthen as well as support the much-acclaimed suggestion that every single ear is unique. The present work may carry a message to the court of law that a questioned profile image of human face can be compared with a control one for the establishment of identity, provided: (i) ear patterns are clearly visible and (ii) both the and control profile views are of the same side.

External Ear, Individuality, Euclidean Distance

67 Anthropologic and Photographic Identification Process of Fragmented Bodies

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The following case studies show the importance of using Anthropology as a supplement of Forensic Photography in cases where dismembered or even decomposed bodies are found. The morphological characterization of bone components, together with the photographic record of human parts, allow the reconstruction of dismember parts using software. This tool is vital to day-to-day forensic work, particularly for those who work at the autopsy room, where forensic scientists are frequently faced with the victims of illegal groups whose intimidation techniques include mutilation and dismemberment of human beings.

Dismemberment is an example of the inhumane practices of the Colombian domestic conflict. It is normally used as an intimidation technique because of the aggressiveness of mutilation. This horrendous act gets rid of the victim, both physically and symbolically. It is also used as an initiation ritual for young illegal combatants and allows the perpetrators to bury the bodies in shallow graves. The slang expression used by paramilitary groups is "a shovel and a half", which means that a grave approximately 60-centimeter deep is enough to bury a dismembered body.

These cases highlight the importance of incorporating basic face reconstruction techniques and image processing to forensic recovery of decomposed, mutilated, or dismembered bodies. These methods are valuable tools that help narrow the search when a large number of body parts are found. It provides positive and sometimes circumstantial information when other methods, e.g. dental charts or fingerprints, are not available.

Visual and photographic comparisons provide enough evidence to determine the consistency of recovered body parts. Discrepancies between bone segments may be solved through the morphological features of the normal anatomic areas or structures. Photographic records remind us of the skeletal morphology and specific features or references of the vertebrae, femurs, humeri, etc. that are preserved in time and do not suffer vital age changes. This is due to the fact that each bone has a sequential model that provides a broad range of evidence and helps resolve inconsistencies when bones are extensively fragmented.

Photographic, Identification, Fragmented Bodies

158 The Development of Forensic Anthropology in Albania

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Objectives: To introduce challenges faced in identification of skeletal human remains and methods used in Forensic Anthropology to address these cases, significant to the development of the medico-legal examinations in Albania.

Synopsis: Information regarding the development of Forensic Anthropology in Albania is presented. Challenges of this discipline are the identification of skeletal, badly decomposed, or otherwise unidentified human remains. In Albania, these cases are analyzed by the Institute of Forensic Medicine in Tirana (est. 1953) and the Criminalistics Laboratory of Tirana (est. 1957).

During 1953-1990, cases of skeletal unknown human remains were rare in Albania. However, from 1990 and on, the transition from an isolated communist society to an open market democracy was characterized with a general recrudescence of criminality and thus an increase in the cases of unidentified skeletal human remains. Under these circumstances, the number of forensic examinations greatly increased and methodologies of Forensic Anthropology were successfully applied to make positive matches possible.

The following methods have been used to:

1. Determine of human origin of bones (comparative anatomy, microscopical anatomy, serological investigation);
2. Determine sex (skull, pelvis, sacrum, long bones, etc);
3. Estimate age (pubic bone, suture closure of the skull, occlusal attrition of the tip of the tooth etc);
4. Estimate stature from skeletal remains (methods of Trotter and Gleser, Telkka, Rollet);
5. Methods of Forensic Odontology and the facial identification via skull-photo superimposition and the graphic method of algorithm have been also used.

The forensic anthropological practice is illustrated with some typical case studies, among them, a case of the collaboration with the Forensic Medicine Institute in Stockholm, the case of identification of victims of the accidental explosion of military ammunition on March 2008, in Gerdec, Albania.

Results: Forensic anthropological methods used in medico-legal examinations in Albania have shown that:

1. For estimating stature from bone length more accurate results are achieved with the Telkka method;
2. For estimating origin of bones the Comparative Anatomy method is used;
3. For estimating sex and age more suitable is the study of pubis, skull etc.;
4. Identification of individuals is conducted using methods of Forensic Odontology and the skull-photo superimposition.

In general, in the Albanian practice of Forensic Anthropology fast, reliable and simple methods are preferred.

Conclusions: The authors have laid out steps that must be taken in Albania to prioritize the development and application of Forensic Anthropology, given that the cases of unknown dead people are increasing. It is also essential that medico-legal experts closely collaborate with forensic anthropologists, criminalistics, forensic dentists and respective specialists in developed countries.

Forensic Anthropology, Identification, Albania

385 Gene Flow and Evolutionary Relationships in Ten Minority Populations of Yunnan by Using Nine Short Tandem Repeat Loci From China

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Nine forensically approved STR loci were analyzed to examine features of differentiation and gene flow in ten Yunnan minorities from China. Previous laboratory analysis focused on statistical analysis of genotype and allele frequencies. This study focused on the phylogenetic history and gene flow of the ten minorities.

Hardy-Weinberg equilibrium tests were performed on genotype frequencies, using Exact tests with Genepop package. Population differentiation tests were also performed with Genepop. Parameters like FIS, FIT, and FST were calculated to examine genetic intra and inter-population variance. HT, HS, and GST were also calculated to examine genetic diversity. All parameters were acquired using Fasta, Harpending, and Ward's R-matrix to determine the gene flow of the minorities.

All of loci of the ten minorities display a good level of heterozygosity except the partial loci of Deang and Miao. The loci demonstrated a forensic index with power of Discrimination >0.8 and a Power of Exclusion >0.5 in the ten minorities of Yunnan Province. After computing genetic distances, NJ trees were constructed which branch into two main groups, one includes Pumi, Yi, Lisu, Naxi, Bai which belong to the northern colonies and the other includes Miao and Dai which belong to the southern minorities. However, Jingpo are northern minorities but associate with the southern minorities. It is concluded that the Jingpo minorities have had a gene exchange with the Dai minorities. Using Harpending & Ward's R-matrix it was found that Bai, Naxi Dai have more gene flow than the other minorities. This supported the Phylogenetic trees which show the Jingpo having a greater probability of interacting with the other minorities. Deang, Dulong, and Miao showed less gene flow than the other minorities. This corresponds with a lower heterozygosity in Deang and Miao. A GST value at 0.014~0.102 was calculated, which shows that differentiation does exist among the region, but loci CSF1PO, D3S1358, D5S818, FGA are <2% which means that these loci do not have a good differentiation.

STR, Gene Flow, Yunnan

492 Morphological, Chemical, and Molecular Biological Methods of Human Age Estimation

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Age estimation has played an important role ever since identification was required. Until the onset of serological methods the only method for identification was the description of a person. Naturally, it was complicated by changes in appearance related to aging. During the last century the expansion of examination procedures from different fields of science has brought forth many methods. Methods of age estimation can be divided into two main groups: morphological and chemical. This research describes a new third category – molecular-biology.

Methods of age estimation using changes of shape, size, and evolutionary stages of different tissues reached its peak with the end of the last century. Scientific knowledge from anatomy and embryology which brought information about tissue changes with age was an early development and is still useful for daily practice. The introduction of Gustafson's age estimation using teeth was probably the most important method for forensic science. This method was revised several times by many scientists and its ease and reliability is still appreciated. The application of the biochemical knowledge of senescence brought about a new procedure - image analysis of tissue color changes. This is related to the accumulation of the products of non-enzymatic tissue browning.

Chemical changes of tissues with aging were of little interest to scientists until the advancement of instrumental methods like spectrophotometry, gas chromatography, high performance liquid chromatography etc. The discovery of the increase of the D- form of aspartic acid in collagen was a breakthrough in these methods. Separation methods like HPLC and GC were used to investigate this phenomenon as well as peptide mapping - a new analytical approach in this field. Another approach to age estimation is the assessment of pentosidin, one of the products of non-enzymatic browning in the tissues.

While morphological and chemical methods are substantially developed, the knowledge of changes of the human genome or transcription for the purposes of age estimation is only beginning. Scientific interest is aimed at two procedures. The first is the measuring of telomere length. The second is the study of gene expression. The length of telomeres was studied by scientists in different tissues. It was discovered that the length of telomeres decreases with age and is different in different tissues. Nevertheless, the results of these studies cannot be applied for age estimation at the present time. The reasons for this are that different methods are used as well as small cohort sizes. Moreover, there is a lack of information about telomere shortening in different tissues in the same person. The objective of our new research project which we have started is to find out whether shortening of telomeres can be used for age assessment. Another method of age estimation could be the study of gene expression using microarrays. The use of DNA microarrays may provide a new tool to measure biological age on a tissue-specific basis and to evaluate the aging process at the molecular level.

The presentation was supported by research project N° 303/08/1569 given by the Czech Science Foundation.

Age Estimation, Methods, Review

585 Research on the Walking Plantar Pressure Distribution of Young People Under Different Shoe - Wearing Conditions

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With changing crime situations, detecting footprints is of increasing importance. However, shoes, as material evidence, have often been thrown away or damaged, greatly hampering criminal investigation. How to use footprints accurately, analyze the physical characteristics of crime suspects, and effectively process cases has become a pressing issue.

This paper examines the anatomy of the foot, plantar pressure stability and influencing factors during running, footprint gait characteristics, and dynamic morphology footprint testing.

Young people were tested under situations which included barefoot, leather shoes, and sports shoes. With the assistance of the "Footscan" analysis system, which specializes on the study of plantar pressure gait, 15 plantar pressure dynamic image data were collected. Photoshop software was used as well to compare and combine the centerline of the plantar pressure distribution patterns of the data collected.

The results demonstrate that the distribution of plantar pressure varies when young people wear different types of shoes. With increased shoe, plantar pressure medial to the centerline gradually converges with the height of shoes increasing, plantar pressure medial to the centerline is not obvious. The trend of the plantar center of pressure in the root zone is from smoothing to fluctuating.

Shoeprint, Plantar Pressure, Center of Pressure

126 Stature Estimation From Digital Radiographically Determined Length of Long Bones of the Upper Extremity

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Regression formulae were calculated to estimate stature from digital radiographically determined length of long bones from the Han population in Sichuan province of China. Statures of 365 healthy adults were measured and digital radiographs of the right upper extremity of each subject were projected in order to measure the length of the long bones. All statistical procedures including description and regression analysis were performed by SPSS.

A significant difference ($p < 0.01$) in male and female measurements was observed. Male measurements were larger than female. Twenty-seven simple regression formulae for stature estimation were obtained from each measurement.

Five stature estimation equations from the sum of the length of humerus and ulna and five multiple regression stature estimation equations from the length of the humerus and the ulna were obtained. Each equation was verified by hypothesis testing and proved to be statistically significant ($p < 0.01$).

In summary sex difference must be kept in mind when choose a stature estimation equation. The regression coefficient(R) of multi-regression was higher than that of simple ones. At the same time the R of simple stature estimation equations using the sum of the length of humerus and ulna was higher than those based on a single measurement. As for simple equations, those based on humerus had a higher R. It is better to choose equations based on the measurement of full-length long bones. The application of digital radiography in forensic cases shows great promise in being less time-consuming, accurate, convenient, noninvasive, and easily entered into a data bank.

Forensic Anthropology, Forensic Radiology, Stature Estimation

386 The Character of mtDNA in the Coding Region for 12S RNA and 16S RNA of Different Races

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Hundreds of mtDNA typings have been described and typing for these polymorphisms is routinely done for gene diagnosis and forensic identification. Some mitochondrial mutations in the coding region of 12S RNA and 16S RNA have already been considered to be related to certain maternally inherited diseases especially different kinds of deafness. As the control for the study of disease-related mutations, specific haplotypes of different races are required. This study collected and analyzed the sequences of 12S RNA and 16S RNA based on the published data from NCBI using four different races: Mongoloid, Caucasoid, Negroid, and Australoid.

Fifty Chinese, 129 African, 106 Italian, and 75 aborigines in Australia, Melanesia, and Papua New Guinea were chosen from the NCBI to represent the Mongoloid, Negroid, Caucasoid, and Australoid separately. These sequences contained the entire coding region. Pairwise comparisons of these sequences with the Cambridge Reference Sequence (CRS) were made using the Software DNASTAR. The specific haplotypes and SNPs for each race were then summarized.

Results: (1) The coding region of 12S RNA: (a) The polymorphism of the length: The length was 953bp in the Caucasoid, Negroid and Australoid. However, because of the mutations 955insC and 1168delA in a separate individual, the length in Mongoloid ranged from 952 to 954bp. **(b): SNP:** The frequency of both A750G and A1438G was quite close to 100% in all races. There were also some race-specific SNP, such as G709A in Mongoloid with the frequency of 26%, G1598A in Australoid with the frequency of 13.33%, and in Negroid, both G769A and G1018A with the frequency of 64.34%, C1048T with the frequency of 18.6%, and T825A with the frequency of 39.53%. With the exception of the transversion T825A with the relatively high frequency of 39.53% in the Negroid, all the point mutations were transitions. **(c): Haplotype:** The most common haplotype in all races was the same, A750G and A1438G. This was especially high in Caucasoid and Australoid (with frequencies of 63.21% and 57.33%, respectively). The second most common haplotype was usually comprised of the race-specific SNP and haplotypes, such as G709A, A750G, A1438G in Mongoloid (18.00%), A750G, A1438G, and G1598A in Australoid (12.00%), and A750G, G769A, T825A, G1018A, C1048T and A1438G in Negroid (10.08%). But because the CRS used as the standard was based on the European sequence, there was no race-specific SNP in Caucasoid, and the second common haplotypes with the same frequency of 4.72% contained G709A, A750G, and A1438G; A750G, A813G, and A1438G; A750G, A1438G, and A1555G. **(d): Conserved sequence:** The conserved sequences in all races had the same part, only 4bp from 1599bp to the end point 1601bp. The other part of the conserved sequences in both Caucasoid and Australoid was 61bp from start point 648bp to 708bp. The one in Mongoloid was the least conserved, which was only 15bp from 648bp to 662bp, and the one in Negroid was 31bp from 648bp to 679bp. **(2) IN the coding region of 16S RNA: (a) The polymorphism of the length:** The length was 1557bp in Caucasoid and Australoid. Because of the insertions 3167insC (4.00%) and 2226insA (2.00%) in a single individual, the length in Mongoloid ranged from 1557 to 1558bp. Because of the insertions 2141insAG (0.78%) and 3158insT (0.78%), and the deletion 2394delA (12.40%) in a single individual, the length in Mongoloid could range from 1556 to 1559bp. **(b): SNP:** The frequency of A2706G was quite close to 100% in all races. There were also some race-specific SNP, such as G3010A in Caucasoid with the frequency of 11.32%, and in Negroid, both of

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G2758A and T2885C with the frequency of 37.98%, T2416C with the frequency of 26.36%, both of T2352C and C2789T with the frequency of 16.28%, A2245G with the frequency of 10.08%. With the exception of the transversion A2792C (0.78%) in Negroid, A1692T (3.77%), C2225A (0.94%) and A1708T (0.94%) in Caucasoid, and A2281C (1.33%), C2263A (1.33%) in Australoid, all the point mutations were transitions. **(c): haplotype:** The most common haplotype in all races except Caucasoid (the most common one was the CRS) was the same, A2706G, which was relatively high in Mongoloid and Australoid (with frequencies of 58.00% and 54.67%, respectively). The second most common haplotype in Mongoloid was A2706G-G3010A (4.00%), the one in Australoid was A2706G and A2768G (8.00%), the one in Caucasoid was A2706G (26.42%), the one in Negroid was T2416C, A2706G, and C2789T (11.63%). **(d): conserved sequence:** The conserved sequences in Mongoloid concluded 44bp from start point 1671bp to 1714bp, only 22bp from 3207bp to the end point 3228bp. The ones in Caucasoid concluded 37bp from 1671bp to 1707bp, only 16bp from 3213bp to 3228bp. The ones in Negroid concluded 22bp from 1671bp to 1693bp, only 18bp from 3211bp to 3228bp. The ones in Australoid concluded 48bp from 1671bp to 1718bp, almost 218bp from 3011bp to 3228bp.

Basically, each race had its own specific SNP in the coding region of both 12S and 16S, except the 16S region in Mongoloid and Australoid, and 12S region in Caucasoid. The most common haplotype was nearly the same in all races, except the 16S region in Caucasoid. The same haplotype rarely occurred in different races except for the most common one, although the same mutation might happen in different races. Generally, the transition between A and G was obviously more than the one between C and T, which might be explained by the triple bond between C and T, so C-T would be more stable than A-G, and had less chance to mutate. This study collected the published data from different sources and utilized them to describe in detail the character of mtDNA in the coding region for 12S RNA and 16S RNA of different races. A relatively convincing control for each race was identified. This would be very useful as the control in further studies of disease-related SNP in mtDNA of different races.

Haplotype, mtDNA, 12S RNA

574 The Research on the Relationship of Foot Pressure Relation on Left and Right Feet of Young People in Walking Normally

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In age and body weight analysis using succeeding footprints or many single ones lifted at the crime scene, it is very important to decide whether the right or left footprints should be used. This is particularly important when both footprints are different from each other. In this paper, foot structure, foot-ground reaction force, and gait characteristics of footprints are discussed with respect to physiology, biomechanics, and footprint examination. Considering the rising tendency of crime by young people, thirty young students were selected. Foot pressure data of both the left and right feet during normal walking were collected using the Belgium made Footscan System. A Pearson correlation was calculated for the average foot pressure data in all six designated areas of both feet using SPSS version 10.0. This was done to analyze the foot pressure relationship between left and right feet. It was shown that foot pressure distribution between the left and right foot correlates to some extent, The highest correlation was found in the heel region. This not only provides a scientific basis to the age analysis by footprints found at a crime scene, but also sets a solid foundation to the analysis and quantitative examination of footprints.

Walking Pattern, Correlation Analysis, Foot Pressure

165 The Sky in the Eye - Exact Determination of Year of Birth in Unidentified Corpses Using the Eye Lens

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Lens crystallines are special proteins in the eye lens that never remodel. Human tissue ultimately derives its ^{14}C content from the atmospheric carbon dioxide. The ^{14}C content of the lens proteins thus reflects the atmospheric content of ^{14}C when the lens crystallines were formed. Precise radiocarbon dating is made possible by comparing the ^{14}C content of the lens crystallines to the so-called bomb pulse, i.e. a plot of the atmospheric ^{14}C content since the Second World War, when there was a significant increase due to nuclear-bomb testing. Since the change in concentration is significant even on a yearly basis this allows for very accurate dating. The authors were able to demonstrate a close relationship between the formation date of the lens crystallines and the birth year of the individual.

A forensic application of this relationship is to determine the year of birth of an unidentified corpse. The eye lens is extracted (a minimally invasive procedure), radiocarbon dating of the lens crystallines is performed, and then, based on a mathematical expression on the formation rates and bomb pulse, the year of birth may be calculated to within +/- 1.5 years.

Identification, Radiocarbon, Mass Disaster

80 Documenting "Toothless" Saw Blade Cut Marks in Bone

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Handsaws are frequently used to dismember bodies. The tool marks present on the cut surfaces of bone can be used to identify the class of saw used. The majority of these tool or cut marks focuses on the saw blade teeth (e.g. the TPI or number of teeth per inch).

Saws are commercially available which do not use teeth as the cutting medium. Due to the lack of teeth, these saws possess few class defining traits. For this study two saws were chosen.

The "MXZ" brand carbide saw has been advertised on various media. This saw has a short blade (13 cm in length) and is encrusted with carbide chips. It is claimed that the saw can cut through various materials including steel, concrete, and tile.

The "Zip" saw is available through hunting outlets and is used to field dress deer by cutting through the pelvis at the pubic symphysis. The saw consists of a fine braded chain of three stainless steel wires and measures 48 cm in length. Smaller irregular segments of wire have been welded to the main wires creating a cutting edge. The cutting wire is attached to two short handles.

In the absence of saw teeth one of the few practical properties of both saws is the cutting width or diameter. For the MXZ saw, 10 measurements were made perpendicular to the blade and the maximum width across the carbide chips was recorded. The recorded widths ranged from 1.85 to 2.23 mm with an average width of 1.99 mm. For the Zip saw, 10 measurements were made perpendicular to the long axis of the saw in the center segment of the saw and the maximum width across the cutting wires was recorded. This ranged from 1.40 to 1.59 mm with an average width of 1.51 mm.

Experimental saw cuts were made using long bones of the white-tailed deer (*Odocoileus virginianus*). Partial (false starts) and complete cuts were made. Kerf widths were measured for the partial cuts and both partial and fully cut surfaces were examined for class-specific characteristics.

The MXZ saw gouges bone in a manner similar to sandpaper. The kerf width at mid cut ranged from 2.02 to 2.50 mm. This is greater than the measured width of the blade and is attributable to the lack of teeth to maintain blade control through the cut. However, the superior margins of the partial cuts were parallel throughout their range. Chipping was evident along the superior margins of both sides of the cut. The kerf floor was marked by parallel striations running the length of the floor. The kerf profile can be characterized as U-shaped with roughly parallel walls. The fully cut surfaces displayed fine striations similar to those of toothed saws. The striations were less sharp than in toothed blade cuts, however.

The Zip saw chisels bone like a toothed saw but lacks the regularity provided by saw teeth. The Zip saw cuts in a curved axis with the cutting force varying in application with how the saw is applied to the bone. The kerf width at mid cut ranged from 1.50 to 1.60 mm. This is nearly identical to the measured width of the blade. The superior margins of the partial cut surface were parallel throughout their range. Chipping was evident along only one side of the superior margin of the cut surface. The kerf floor was marked by parallel striations running the length of the floor. The kerf profile can be characterized as semi-circular with well rounded walls at the base. The fully cut surfaces are marked by fine curved striations similar to those created by circular and gigli saws. The curved striations were most obvious at the beginning and end of the cut. This corresponds to the greatest pressure being applied to the bone surface.

In conclusion, the absence of saw teeth, while removing a substantial amount of saw information, does not negate the possibility of identifying the class of the saw.

Saw, Cut Marks, Dismemberment

127 Alcoholism Related Weight Loss in Bone

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The clinical, biochemical, and electrophysiologic changes associated with the prolonged and excessive consumption of alcohol have been well documented in medical literature. The strong correlation between chronic alcoholism and select hepatic, cardiovascular, neuromuscular, and neurological diseases are also widely known among diagnosticians. Confounding comorbidity factors (such as poor nutritional status, malabsorption, mineral deficiency, reduced mechanical loading, cigarette smoking, and other disease processes) have, however, complicated many attempts to isolate the unique effects of ethanol abuse on bone. Moreover, population-based analyses of alcohol-related bone loss are hindered by a lack of control for patient age, sex and age specific hormonal effects, variability in the duration and patterns of alcohol abuse, and questionable self-reporting, which often yield obscured and contradictory results. Reported symptoms indicative of osteoporosis in alcoholic patients are frequently disregarded by practitioners and evidence of skeletal demineralization is often attributed to diagnoses of other bone conditions or identified simply as idiopathic osteoporosis.

The acknowledged difficulty in explaining the effects of prolonged alcohol abuse on bone microstructure and the lack of consistency in diagnosing the observable skeletal changes and associated symptomology among the living has hampered efforts to make any such identification among the dead. Although it is common knowledge among forensic anthropologists that chronic alcoholics frequently present boney characteristics very similar to those observed in individuals of advanced age or "osteoporotic" skeletons, this information is often inherited from mentors or practically acquired while working with skeletal collections for which medical history is reported or in similar "known" contexts. Alcoholism has received little attention in discussions of forensic anthropological method and theory. In fact, a recent literature review of AJPA and JFS shows an absence of empirical investigation and published documentations. As a result, suggestions of alcoholism are commonly relegated to side notes (possible alcoholic?) when, for example, the assessed age indicators do not warrant an

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assignment of "old age" of the unknown individual and do not support an age-related diagnosis for the skeletal demineralization, or when other pathological explanations are not logical. Recently, the role of chronic alcoholism as a causative agent in the progressive and significant bone loss among young to middle aged males has begun to receive research attention within the medical community. Clinical data at large attests to the harmful degenerative effect of chronic alcohol abuse on the male skeleton, which is in important contrast to a neutral (or even a possible favorable effect) of light to moderate alcohol consumption, particularly among older, post-menopausal, females. This new evidence, therefore, opens up an avenue for the investigation of alcoholism in forensic skeletal material, when sex and age are known or estimated with reasonable statistical certainty.

The intention of this project is to statistically evaluate, using pairwise probability models, the often believed and yet untested assumption that chronic alcoholics express skeletal degeneration in the form of bone weight loss, not unlike older osteoporotic individuals. Using both new and previously reported post-cranial bone weights for a sample of 454 modern American males drawn from the William M. Bass Donated Skeletal Collection, this project tests the forensic anthropologist's ability to differentiate between known chronic alcohol abusers (males, 20-70 years) and non-alcoholics (males, 20-70 years) using bone weight alone. Further, this study compares the bone weight distribution of known chronic alcoholics (males, 20-70 years) to that generated from a sample of older individuals presenting age related degenerative changes in mineralization and a significant loss of bone density (males, 70+ years). Recommendations for including an assessment of bone weight with the biological profile for the unknown skeletal remains under analysis are also provided. It is believed that this project will contribute to the larger disciplinary theory by providing statistically determined conclusions on the appropriateness of suggesting alcoholism for young to middle aged males with low bone weight and who do not exhibit pathological characteristics suggestive of other conditions to which bone loss could be attributed. Moreover, it will also offer information on the usefulness of individual bone weight measures in forensic anthropological practice.

Forensic Anthropology, Bone Demineralization, Alcoholism

132 Thermal Analysis of Bones in Forensic Applications

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In this study thermal and microscopic techniques were used for the analyses of bones in forensic applications. Earlier studies at the University of Technology, Sydney demonstrated the potential of thermal analysis as a technique for characterising changes in the younger post-mortem bones that may be encountered in forensic situations, but used a limited range of samples [1,2]. In the current study, a range of pig bone samples prepared under controlled conditions were studied using thermogravimetric analysis – differential thermal analysis (TGA-DTA), thermogravimetric analysis – mass spectrometry (TG-MS), pyrolysis gas chromatography – mass spectrometry (Py-GC-MS) and environmental scanning electron microscopy (ESEM). TGA-DTA analysis demonstrated that samples studied in both air and nitrogen atmospheres may be useful for the estimation of the post-mortem age of bone samples and the air atmosphere showed a better correlation with age. A comparison of TG and DTA curves and the various m/z ions in TG-MS analysis indicated that these could be used to estimate the post-mortem age of bones. Py-GC-MS also demonstrated a relationship of particular peak ratios with the post-mortem age of bones. ESEM analysis showed that there is some correlation between the number of pores, the pore sizes, and the post-mortem age of bones.

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Bone, Thermal Analysis, Microscopy

143 Sexual Dimorphism of Index to Ring Finger Ratio in South Indian Adolescents

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Definitive sexual traits are not manifested until after the full development of secondary sexual characteristics that appear during puberty. Thus sex determination from prepubertal human remains is a challenge for forensic experts and physical anthropologists worldwide. This research was undertaken to investigate sexual dimorphism of the index and ring finger ratio in South Indian adolescents.

Material and Methods: The study was conducted on 350 adolescents (175 males and 175 females) of South Indian origin between 12 and 18 years of age at Manipal in coastal Karnataka, South India. The index finger length (IFL) and the ring finger length (RFL) were measured in millimeters on each hand. The distance between the mid point of the proximal most flexion crease at the base and the most forward placed point (tip) of each finger in the midline on the ventral (palmar) surface were recorded for each hand. The index and ring finger ratio was computed by dividing index finger length by ring finger length. The data obtained was analyzed statistically using SPSS (Statistical Package for Social Sciences, version 10.0) computer software. Student's t-Test was performed to compare the lengths of the

index and the ring finger along with the ratio between the two hands. The test was also used to compare the ratio between both sexes. The obtained p-value ≤ 0.05 was considered significant.

Results: Mean IFL and RFL values were significantly higher in males for both hands. Difference in mean RFL between males and females was, however, more than the differences in mean IFL in both hands. In all the examined hands, the mean RFL was greater than the mean IFL in both males and females. The index and ring finger ratio derived from the finger lengths ranged from 0.88 to 1.00 in males with a mean of 0.9504 and from 0.92 to 1.06 with a mean of 0.9872 in females for the right hand. For the left hand, the index and ring finger ratio ranged from 0.89 to 1.00 in males with a mean of 0.9517 and from 0.90 to 1.05 with a mean of 0.9879 in females. The derived ratio showed a statistically significant difference between males and females ($p < 0.001$). The index and ring finger ratio did not show any significant differences between the two hands in males and females.

Conclusions: The study reveals that the index and ring finger ratio shows sexual dimorphism in South Indian adolescents and thus may prove useful to determine the sex of an isolated hand when it is the subject of a medicolegal examination. The index and ring finger ratio is found to be higher in females when compared to their male counterparts in both hands. The study suggests that a ratio of 0.9700 or less is suggestive of a male for both hands, while a ratio of more than 0.9700 is suggestive that the hand is of female origin. Similar studies are proposed to confirm the findings of our study and to determine if sexual dimorphism in the index to ring finger ratio is a constant feature in other population and age groups.

Forensic Anthropology, Identification, Index to Ring Finger Ratio

418 Study on Identification by Using Elbow Joint Computer Radiographic Films of Chinese Han Adults

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The goal of this study was to provide an easy way for the identification of computer radiographic (CR) film in forensic anatomy and clinical examinations by researching the measurement variables characteristic of elbow joints observed in the CR films of Chinese Han adults. Methods: The study was conducted by measuring 95 pairs of CR films taken from Chinese Han adults between the ages 18 and 32 years. The films were taken at more than one month intervals. The results were analyzed by Statistical Package for Social Sciences (SPSS), version 12.0. The measurement variables were calculated and the differences were used to identify two groups of CR films based on the reference range of the differences. Results: Eight measurement variables were analyzed by SPSS 12.0 and four were selected because of their repeated measurement stability. The study found that the differences between the coefficients of variation of the variables were not large. Conclusion: The study concludes that the method of determining the difference range of the four variables is a viable identification method.

Computer Radiographic Film, Identification, Forensic Radiology

427 Study on Identification Using the Skull Computer Radiographic Films of Chinese Han Adults

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Identification using radiographic image materials is one of the important studies of forensic radiology. Twelve measurement variables on frontal CR films and 8 measurement variables on lateral CR films were selected by measuring 102 pairs of frontal computer radiographic (CR) films and 89 pairs of lateral CR films, which were taken from Chinese Han adults between the ages of 18 and 32 years and taken one month apart. The researchers then selected the maximum cranial breadth, the minimum frontal breadth on frontal CR films, and the angle of glabella-inion (G-I) line using the coronal plane on lateral CR films as reference variables. Through making statistical analysis by statistical package for social sciences (SPSS), four variables were eliminated on the frontal CR films and two variables on the lateral CR films because of their instability. Six variables were identified on the frontal CR films: minimum frontal breadth, frontal sinus breadth, bizygomatic breadth, bigonial breadth, nasal height, and facial lowest angle. Six variables were also identified on the lateral CR films: morphological facial height, 15 cm behind glabella height, n-s length, G-I length, 4 cm above sphenoid point length, and the sphenoid tuberculum angle.

To validate its effect, one CR film from one group and 20 films (including a film with the same number as the previous) from the other group were randomly selected from frontal CR films and lateral CR films to perform blind tests. As a result, the identification rate was 100%.

Computer Radiographic Film, Identification, Forensic Radiology

542 Stature Estimation From the Length of the Sternum in South Indian Males: A Preliminary Study

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Establishment of the identity of human skeletal remains carries tremendous medico-legal significance. Stature provides one aspect of an individual's physiognomy and its determination is one of the important initial steps during the forensic analysis of human skeletal remains.

The aim of the present study was to derive a linear regression formula for estimating stature of South Indian adult males from the length of the sternum.

The materials for the present study consisted of 35 male sternums of South Indian origin dissected from cadavers autopsied at the Department of Forensic Medicine, Kasturba Medical College, Manipal. The dissected sternal plate was macerated using sodium hypochlorite solution and dried. The combined length of the manubrium and the mesosternum was measured to the nearest millimeter using vernier calipers. The data was analyzed using Statistical Package for Social Sciences (SPSS, version-10.0) to derive the linear regression equation for stature estimation. Pearson's correlation coefficient was calculated to assess the correlation between the stature and the sternal length. Student's t-Test was applied to find out the status of significance.

The cadaveric length ranged from 148.00 cm to 181.00 cm with a mean of 166.47 cm. The length of measured sternums ranged from 10.60 cm to 16.10 cm with a mean of 14.20 cm. The results of the present study show a significant correlation between stature and sternal length in adult south Indian males. The regression equation: $\text{Stature} = 117.784 + [3.429 \times \text{Sternal length}]$ was derived.

This preliminary study concludes that the sternal length can be used as a tool for stature estimation in adult South Indian males. Similar studies on a larger sample are thus proposed.

Forensic Anthropometry, Stature, Sternum

551 Human? Animal? Case of Mixed and Incomplete Skeletal Remains Solved: Successful Identification

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When the skeletal remains are incomplete, the identification process may cause many problems and difficulties. It is necessary to determine if there are any special characteristics that can help identify the remains. Skeletal changes including healed fracture, evidence of surgical intervention, and different kinds of complications of trauma leave unique signs long after the event has occurred. Those kinds of features are very helpful in the identification process, especially when they are recorded.

Incomplete, human and animal (dog), skeletal remains were found in the forest. The bones were without soft tissue and partially eaten by animals. Among the human remains present were the skull without the mandible, the left scapula, one rib fragment, the left and right tibias (left without ends; right without upper end), and the right fibula (without ends). Present in the skull were two gunshot wounds: one entered at the central back of the skull and exited at the central of the frontal bone and the second one entered at the down-left part lambdoidal suture and exited at the upper-frontal area right parietal bone. The skull showed a healed nasal fracture and the right tibia and right fibula showed healed fractures. The right tibia showed arthritic changes of the down end. In certain time intervals in the same location, other elements of skeleton were also found. Anthropological analysis demonstrated that the remains originated from a 30 to 40 year old male, 177 cm in height. A reconstructed face was made on the basis of the incomplete skull. Results of the studies, including the reconstructed face, were returned to the unit dealing with the case. In approximately six months, the unit submitted the following materials of a missing person selected on the basis of the reconstructed face: 36 year old male, 178cm tall, photos of the person, information from family that he had broken his right leg in a car accident, arthritic changes of the ankle. Traits of the reconstructed face clearly resembled those of the face of the missing person. A superimposition test disclosed compatibility of structural traits of all analyzed morphological elements of skull and face, parameters, and cranio- and cephalometric points. Interestingly, the missing male's car was also found and at the time he went missing, he was accompanied by his dog.

Skeletal Remains, Human Identification, Skull

572 Availability of Comparison Materials in a Skull-Based Identification Procedure: Analysis of Cases of Examined Human Skulls at the Department of Forensic Medicine University of Medical Sciences in Poznan in the Period Between 1996 and 2005

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The entire skull-based complex comparative identification procedure consists of several detailed studies from different disciplines of science. The discipline of performed studies depends, first of all, on the available and collected comparative material, pertaining to the examined person. The final result of the complex identification procedure represents the results of individual stages of the studies.

The research was conducted on the human skull-based identification process and it was done at the Department of Forensic Medicine University of Medical Sciences in Poznan in the period between 1996 and 2005. Identification researches conducted on 348 skulls were analyzed. The research was mainly identification through face reconstruction and comparison skull/photo. One hundred and ninety-eight skull-based comparison research identifications were done in the mentioned period.

Beyond doubt, photographs of the missing persons (evidential, occasional or passport types) selected for identification efforts, represent the most common and available comparative material. Odontological tests involving comparison of dentition in the examined human skull with dentition of the typed person, established by the available comparative material, represent a significant element of the identification procedure. In the studies, all available records of stomatological treatment, orthodontic charts and radiograms are used. Statistically, only 22 cases of comparison researches had stomatological records available. Even so, dental records have not always been relevant. In four cases the dental records were incomplete, inaccurate or unreadable. Unfortunately, it is still very difficult to obtain stomatological records for identification purposes in Poland.

The radiograms have one of the highest diagnostic values for the identification process. Especially valuable are those radiograms that concern the parts of skeletal elements that are anatomically variable or exhibit different kinds of changes. Radiological records were available for comparison studies in 15 cases.

In conclusion, 162 out of 198 skull-based identifications (82%) carried out between 1996-2005 were positive, 34 (17%) were negative, and two (1%) were declared as "impossible to define."

Human Identification, Superimposition, Dental and Skull Radiographs

Forensic Biology, DNA Profiling, and Serology

554 Application of the VALID™ Software to Manage Quality Assurance Activities

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As the demand for processing DNA evidence has continued to grow, so has the development of new technologies for DNA analysis. An important component to successfully implementing new technologies is to establish quality assurance (QA) measures to ensure the quality and integrity of the data and competency of those performing DNA analysis.

The goal of this presentation is to familiarize participants with the application of VALID™ Software to effectively manage day-to-day quality assurance activities such as instrument performance checks, reagent QC, and analyst training.

This presentation will focus on the workflow of one quality assurance activity to demonstrate the use of the VALID™ Software to support and streamline a laboratory's quality program. The following software features and functionality will be highlighted: flexible experimental design tools to accommodate a variety of objectives and experience levels, data analysis tools for rapid assessment of instrument, chemistry and individual performance, customized worksheets and on-line help that provide detailed protocol information and recommendations as well as automated reporting functionality to meet documentation needs.

The workflow and software features described above help provide objective evidence and establish a solid foundation to regularly monitor validated procedures and performance.

Quality Assurance, Validation, VALID™ Software

166 Success Rate of DNA-Typing of Vaginal and Anal Swabs in 34 Sexual Assault Cases

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After a sexual assault, intimate swabs from the vagina and/or anus of the victim are collected during the medical-legal examination and smears are made by wiping the swabs on microscope slides. These smears from these intimate swabs are analyzed for the presence of semen by microscopic analysis. The swabs are subsequently subjected to DNA-profiling. Thirty-four (34) comparable sexual assault cases were reviewed to assess (1) the presence of semen and (2) the presence of a foreign male DNA-component. These sexual assault cases were also assessed for which factors (such as time, amount of sperm cells) contributed to a positive or negative outcome of these results.

In 34 cases the smears of 103 vaginal and 31 anal swabs were microscopically analyzed for the presence of sperm cells. In 17 cases sperm cells were observed (in 57% of the vaginal swabs and 32% of the anal swabs). The presence of sperm cells could be related to the time-interval between the assault and the examination.

DNA-extraction by differential lysis and subsequent DNA-quantification, amplification and SGM+ DNA-typing was performed on swabs from 31 cases (62 vaginal and 14 anal). The DNA-profiles obtained were compared to the DNA-profiles of the victims. In 16 out of 31 cases a foreign male DNA-component was present in the DNA profile. However, in one of these cases no sperm cells were observed in the smears of the intimate swabs. In two cases in which sperm cells were observed no male DNA profile was obtained from the swabs.

In conclusion, in 34 cases in which the victim declared that vaginal and/or anal penetration had occurred (without the use of a condom), DNA typing of the swabs revealed the presence of a foreign, male DNA-component in almost half (47%) of the cases.

Sexual Assault, DNA-Typing, Success Rate

246 Micromanipulation Separation of Cells for Short Tandem Repeat Analysis

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Biological mixtures are common forensic evidences these include semen stains of sexual assault cases and residues of chorionic villi after pregnancy termination. However, cross-contamination poses to be a problem for accurate detection. The introduction of micromanipulation and laser microdissection (LCM) has greatly improved the capability to select single cell without any cross-contamination.

The presentation will discuss the use of micromanipulation method, which is cheaper than laser microdissection (LCM), for cell isolation. Buccal cells were separated from cotton swab suspension. The cells obtained by micromanipulation were amplified with MiniFiler kit (Applied Biosystems, CA), and detected by ABI3130 genetic analyzer. Ten, five, three, and one cells were isolated and detected in ten repeated experiments. Full DNA profile was successfully obtained for ten cells. Complete genotyping results were obtained for three or five cells but with stochastic effects demonstrated (ADO rate 3 cells=7.78%; ADO rate 5 cells=4.44%). The experiments on one cell gave incomplete and partial profiles, with 54.44% of alleles were detected (98/180). It is shown that single cell isolation and detection is feasible, but further work is needed to improve the detection sensitivity.

To explore the feasibility of sperm cell isolation, artificially made sexual assault mixture samples were made. Micromanipulation and preferential lysis was conducted in parallel. DNA obtained from the sperm cells was amplified by the Identifiler amplification kit (Applied Biosystems, CA). Micromanipulation was found to outperform preferential lysis. Results of 12 mixture samples for both methods showed significant difference ($P < 0.05$). In addition, multiple displacement amplification (Qiagen, Germany) was explored on 20 isolated sperm

Forensic Biology, DNA Profiling, and Serology

cells to expand the detection sensitivity. It was determined that sperm lysis at 37 degrees rather than the recommended icy lysis could provide much better results. Compared with the result of the icy lysis, all the 16 STR loci could be detected, and the preferential amplification and allele dropout were diminished to some degree. A semen stain mixture sample from casework was used subsequently to examine the feasibility of the micromanipulation-MDA-STR analysis flowchart in forensic practice. The result is fully concordant with the previously genotyped blood sample of the perpetrator. These results demonstrate the benefit of micromanipulation for cells isolation from mixture samples.

Sperm Cell, Buccal Cell, Micromanipulation Method

238 Comparison of Five Fabric Types as a Swabbing Medium for the Removal of DNA From a Glass Surface

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The ability to extract and subsequently type low copy number (touch) DNA may depend on the ability to maximize the removal of DNA from surfaces. The ability to remove DNA from surfaces may depend on the type of swabbing material used. In order to see if differences in the quantity of touch DNA can vary with the type of swab, five common materials (nylon, acrylic, wool, polyester felt, and cotton) were used to respectively swab glass surfaces containing two ul of whole saliva diluted 1:10 with saline. Eight replicates of each swab type were tested and subjected to three common DNA typing techniques: Chelex® (Biorad) extraction, ChargeSwitch® Forensic DNA Purification (Invitrogen), and low-copy number DNA extraction using proteinase K and carrier RNA. DNA quantity for each extracted sample was determined by real-time PCR employing SYBR Green® using a Corbett Rotorgene 6000. For both the Chelex® extraction and the ChargeSwitch® method, no notable difference in the quantity of DNA was determined between the two methods and between fabric types. The Chelex® extraction yielded mean values from 8 pg/ul (cotton) to 28 pg/ul (nylon) while the ChargeSwitch® method yielded mean values from 10 pg/ul (nylon and wool) to 34 pg/ul (polyester felt). There was significant overlap in quantitation values between the five fabric types for both methods. However, the low-copy procedure showed substantially higher values for four of the five sample types than the other two methods (the one exception being wool which yielded a mean value of 8 pg/ul). Cotton showed a mean value of 68 pg/ul (8.5 fold larger than Chelex® extraction and 2.5 fold larger than the ChargeSwitch® method), acrylic yielded a mean value of 79 pg/ul (3 fold larger than both the ChargeSwitch® method and Chelex® extraction), nylon produced a mean value of 122 pg/ul (4 fold larger than Chelex® extraction and 12 fold larger than the ChargeSwitch® method), and polyester felt yielded a mean value of 144 ng/ul (9.5 fold larger than Chelex® extraction and four fold larger than the ChargeSwitch® method). Polyester felt showed a minimal value of 115 pg/ul, compared to minimal values of 51 pg/ul for acrylic, 41 pg/ul for nylon, and 38 pg/ul for cotton. Based on these preliminary results, polyester felt appears to have a preferential ability to remove DNA from surfaces as compared to the other four fabrics used in the study. Future work will focus on testing additional fabrics as well as testing smaller quantities of DNA on substrates.

DNA, Swabbing, Extraction

561 Advancing Microfluidic Systems Honed for Forensic DNA Analysis

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With a forensic view towards more rapid and cost-effective analysis methods, microdevices become an increasingly more viable option for improving forensic DNA analysis. Microdevices have the potential to drastically reduce the time, reagents, and cost required to perform a wide variety of the processes associated with genetic analysis, including DNA extraction, PCR amplification, and separation and detection of STR amplicons. Inexpensive glass microchips are being developed and tested to improve the efficiency, reproducibility, and automation of the current time-consuming bench-top processes. A fully-integrated, microchip capable of performing the steps normally carried out at the bench would not only reduce the time required to perform these tasks, but would also eliminate user intervention and potential sources of contamination, preserving more of the sample for future analysis. PCR and high-resolution DNA separations are now readily carried out on-chip, as well as solid-phase extraction (SPE) of DNA from a variety of clinical, biohazardous, and forensically significant samples. With successful microchip adaptation of these processes now commonplace, research focus has shifted towards integration of these methods with other sample processing steps (cell sorting, volume reduction, DNA quantification)--the first step towards creation of a stand alone device with full-genetic profiling capabilities. Due to the multi-step nature of the DNA analysis process, careful consideration of solution compatibility, sample size, and fluidic interfacing must be taken in order to seamlessly integrate these technologies. As a result, attention is now being paid to device design and concept, and multi-component microchip analysis is now becoming a reality. The research presented here describes the advancement of integrated sample analysis in microfluidic devices for forensic application. With a focus on the fabrication and implementation of integrated glass microdevices for extraction, PCR amplification, and separation of DNA (as well as other analysis steps), particular attention is devoted to device design and sample handling considerations.

DNA, Microchip, STR

Forensic Biology, DNA Profiling, and Serology

262 Genebench-FX™: Towards Sample-in to Results-out Analysis of Forensic Samples in Under 45 Minutes

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NetBio's major goal is to develop a fully integrated system that enables rapid sample-in to results-out functionality for human identification from forensic samples. This integrated system is based on microfluidic technologies which provide performance advantages through miniaturization and automation by ease of integrating fluidic components. The system is divided into three modules: DNA extraction, purification and quantitation, multiplexed short tandem repeat (STR) amplification, and separation and detection.

This presentation will focus primarily on the performance of the separation and detection module which is now completed. The Genebench FXTM instrument is based on electrophoretic separation and laser-induced fluorescence detection. Separation takes place in a microfluidic biochip which can process 16-samples simultaneously. The biochip accepts samples of DNA that have been extracted and amplified using conventional technologies. The instrument works with commercially available four and five color STR amplification kits, is designed to be operated in a forensic laboratory, and has been ruggedized for optional field use. Data presented will include representative results from commercial STR kits, including resolution, sensitivity, and precision, to show the system meets or exceeds all the requirements for analysis of STRs with respect to both technical operation, reproducibility, and interpretation guidelines. Taken together, these results demonstrate accurate and reproducible STR separations with better than single base pair resolution, suggesting that Genebench-FX™ is well suited for integration of the sample preparation and amplification modules.

The ability to analyze DNA evidence rapidly, both in the forensic laboratory and at the crime scene, has the potential to dramatically reduce the time between sample collection and generation of a fully characterized STR profile. This capability would impact an investigation from the outset by allowing suspects to be apprehended more quickly, reducing the time and costs of criminal investigations, and even more importantly, rapid apprehension which would limit recidivism and significantly improving public safety. The completion of Genebench FXTM represents a major step towards the development of a fully integrated instrument that will perform sample-in to results-out analysis of forensic samples in less than 45 minutes.

Electrophoresis, Short Tandem Repeat, Microfluidics

586 A Multiplexed SNP Detection Assay for Human Identification

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Single nucleotide polymorphism (SNP) profiling is a very powerful tool for human identification testing purposes especially in instances where DNA is highly degraded, as with disaster victim identification (DVI), and in typing mitochondrial DNA. SNPs have also been used for paternity testing, genealogical studies and more recently in population-based stratification of patient groups in clinical trials. An optimized a detection system for identification of fixed sets of known mutations and SNPs will be presented. The method involves a multiplexed PCR amplification of ~ 50 regions in the human genome, followed by detection of mutations or SNPs in these amplicons using an oligonucleotide ligation assay (OLA). Optimization of the multiplex PCR was achieved using primer titration and minimizing primer-dimer formation. The ligated products were hybridized to coded sequences with mobility modifiers and detected by capillary electrophoresis. Direct detection by CE following ligation is also possible. The SNPs used were selected as a set of highly discriminative SNPs suitable for forensic analysis based on criteria described in Pakstis et al., Human Genetics, 2007. A gender specific deletion marker was also designed. To test the accuracy of the method and to compare relative utility of SNP analysis to STR analysis for human identification and paternity testing, a panel of 41 individuals from three different CEPH families spanning three generations was genotyped. The test samples were genotyped using 40 SNPs with the SNP detection system, and also with Identifiler™. The mean number of SNP genotype differences was ~ 22 compared to ~ 14 with Identifiler™. The results indicated that the overall informativeness in this European population is slightly lower compared to Identifiler™. Addition of 5-8 additional high frequency SNPs to the panel will result in a SNP panel with informativeness comparable to that of the Identifiler™ markers. The SNP panel was also tested with degraded DNA and DNA from blood, semen, and saliva samples.

The results indicate that carefully selected SNPs can be as useful as STRs in human ID testing and related applications. The development of highly multiplexed SNP detection systems enabling lower cost, higher automation, and higher throughput will result in increased use of SNP profiling in a number of applications.

SNP Detection, Human Identification, Capillary Electrophoresis

Forensic Biology, DNA Profiling, and Serology

664 Haplotype Block: A New Type of Forensic DNA Markers

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Sensitivity of detection and discriminatory power of Short Tandem Repeats (STRs) and Single Nucleotide Polymorphisms (SNPs) have made DNA typing a universally accepted powerful tool in forensic investigations of both civil and criminal cases. Currently, forensic DNA typing uses a set of highly informative STR markers. SNPs are being investigated to serve as a complementary tool because they are abundant in the human genome and are applicable to analysis of highly degraded specimens where STRs may not provide results. While SNPs can provide an alternative approach, on a per locus basis they have a low power of discrimination. With the completion of Human Genome Project (HGP) and discovery of block structures in the human genome a novel set of SNP markers are available for further exploration for forensic utility. Several neighboring, tightly linked SNPs are inherited together from one generation to the next, barring mutations. These SNPs form haplotype blocks, which have a higher discrimination power than individual SNPs. In essence, a haplotype block is equivalent in power to that of an STR. The haplotypes of these "pseudo STRs" would be analogous to alleles at individual STR loci. The presentation will define a haplotype block as a group of neighboring SNPs with high Linkage Disequilibrium (LD) for each pair of SNPs, measured by r^2 (> 0.8 or 0.9). For forensic purposes, the haplotype blocks should exist in all three major populations (Caucasian, East Asian, and African), and the heterozygosity of blocks in each population should be greater than a threshold (currently set at 0.2). Ideally, a block should contain at least five SNPs, with a minimum of three haplotypes in each block. In HapMap Phase II data, 18 and 53 such blocks were found on chromosome 1, with $r^2 > 0.9$ or 0.8 , respectively. The expected and observed genotype and haplotype sharing conformed with each other, supporting haplotype independence between blocks even when they are syntanic. Further, Hardy-Weinberg Equilibrium (HWE) for each block and LD between each pair of blocks was tested. After removing blocks deviating from HWE or in LD with other blocks, seven blocks were found with $r^2 > 0.9$, and 13 with $r^2 > 0.8$ on chromosome 1 alone. The cumulative power of discrimination of these blocks was 0.998 ($r^2 > 0.9$) or 0.99999 ($r^2 > 0.8$). Similar results can be found on other chromosomes.

This is the first effort to assess the feasibility of block structure for identity testing and forensic purposes. Kinship estimation and mixture detection based on haplotype blocks will be studied.

Haplotype Block, HapMap, Forensic DNA Marker

174 Development of a Forensic Screening Tool: The PowerPlex® S5 System

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This presentation will provide understanding of the utility and performance of the PowerPlex® S5 System in forensic DNA typing and sample screening applications.

Multiplexed Short Tandem Repeat (STR) analysis has become the dominant technology in DNA-based human identification. As the number of samples typed per case increases, especially in complex homicide or sexual assault cases, the need for less expensive methods for screening these multiple samples becomes apparent. By using a simple yet extremely sensitive STR system, the forensic DNA laboratory can quickly discriminate between the limited number of donors present in a given case. In addition, large populations of potential donors can be mass-screened inexpensively at a level of discrimination sufficient to identify only a very small number of possible matches. Following this, the laboratory can then select the most probative DNA samples to continue with a full complement of STR testing.

The PowerPlex® S5 System has been developed for the co-amplification and two-color-detection of four STR loci: (D18S51, D8S1179, TH01 and FGA) and Amelogenin. The amplicon lengths of the largest loci have been significantly shortened so that all amplicons are less than 260bp. The robust and careful design of the PowerPlex® S5 System provides maximum sensitivity with low quantities of DNA (less than or equal to 50pg). This makes the system ideal for use with low copy number samples including touch samples. The reduced number of loci in the PowerPlex® S5 System provides enough data for screening purposes at an economical price point. Based on United States Caucasian population frequency estimates, The PowerPlex® S5 System has a power of discrimination (PD) of approximately 1.9×10^5 .

In this multiplex, one of the two primers for Amelogenin, D18S51 and D8S1179 are labelled with fluorescein and one of the two primers for TH01 and FGA are labelled with 6'-carboxy-4',5'-dichloro-2',7'-dimethoxy-fluorescein (JOE). Sizing of amplicons is provided by an internal size standard (Internal Lane Standard 600) labelled with carboxy-X-rhodamine (CXR). The PowerPlex® S5 System is the first STR multiplex from Promega to include Taq enzyme and hot-start PCR technology as part of the system. Analysis can be done with the ABI PRISM® 310 Genetic Analyzer, ABI PRISM® 3100 Genetic Analyzer, and ABI PRISM® 3130 Genetic Analyzer.

Sensitivity testing and inhibitor testing data will be shown. Discussions of laboratory efficiency gains from screening DNA samples with a small STR multiplex will also be included.

Forensic DNA, STR, Screening

Forensic Biology, DNA Profiling, and Serology

379 Sequential Unmasking: A Means of Minimizing Observer Effects in Forensic DNA Interpretation

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Observer effects are rooted in the universal human tendency to interpret data in a manner consistent with one's expectations. This tendency is particularly likely to distort the results of a scientific test when the underlying data are ambiguous and the scientist is exposed to domain-irrelevant information that engages emotions or desires. Despite impressions to the contrary, forensic DNA analysts often must resolve ambiguities, particularly when interpreting difficult evidence samples such as those that contain mixtures of DNA from two or more individuals, degraded or inhibited DNA, or limited quantities of DNA template. With advances in technology, DNA testing has increasingly been used to analyze marginal samples that are likely to produce ambiguous results, such as older samples, samples exposed to environmental insult, and limited samples resulting from incidental contact. Consequently, the need for measures to minimize the consequences of observer effects in forensic DNA testing is growing.

The full potential of forensic DNA testing can only be realized if observer effects are minimized. These problems can be minimized by preventing analysts from knowing the profile of submitted references (i.e., known samples) when interpreting testing results from evidentiary (i.e., unknown or questioned) samples. The necessary filtering or masking of submitted reference profiles can be accomplished in several ways, perhaps most easily by sequencing the laboratory workflow such that evidentiary samples are interpreted, and the interpretation is fully documented, before reference samples are compared. Sequential unmasking could also be employed to combat observer effects in other areas of forensic science.

Observer Effects, Contextual Bias, DNA Interpretation

368 Analytical Principals in the Interpretation of DNA Profiles

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A major issue in DNA typing is the interpretation of electropherograms resulting from low level and degraded DNA templates. This presentation will discuss the principles of the analysis of electrophoretic data from the standpoint of capillary genotyping systems. The discussion will detail the application of signal to noise ratios, limits of detection, stochastic thresholds, and dynamic range to assist the examiner in screening results and interpreting data. An overview of how real time PCR can be used in combination with these data will also be included.

The application of these principles in the analysis of poor quality DNA template will then be discussed. Specific examples will be used to explore data interpretation involving electropherograms resulting from degraded, inhibited, and low copy DNA. The presentation will include results from the literature as well as the author's own research into the use of miniSTRs.

DNA Typing, Electrophoretic Principles, miniSTRs

175 Validation of an Extraction Methodology for Obtaining of High Quality Genomic DNA From Forensic Evidence Samples

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Forensic evidence samples vary largely in sample types. They are exposed to environmental insults, contaminated with PCR inhibitors and are often available in limited quantities. Isolation of DNA from forensic evidence samples, therefore, can be challenging, which creates bottlenecks in the sample processing workflow. The presentation will discuss a genomic DNA extraction method that enables lysis of various sample types, removal of PCR inhibitors and high recovery of DNA particularly from samples that contain low quantities of DNA. The method employs a proprietary chemistry for sample lysis, and magnetic particles for purification of DNA. The validation studies were

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performed following the revised validation guidelines provided by the Scientific Working Group on DNA Analysis Methods (SWGDM). Quality of the DNA extract was evaluated for down stream applications such as real time PCR using the Quantifiler kits and STR profiling using the AmpF Φ STR $\text{\textcircled{R}}$ Identifier $\text{\textcircled{R}}$. STR profiles obtained from compromised samples were devoid of any PCR artifacts. Performance of the developed method for extraction of DNA was compared to traditional phenol/chloroform method and several commercially available kits. Sample types investigated include liquid blood, blood stains on denim, cotton fabric and FTA paper, buccal swabs, liquid saliva, saliva stains on fabric, semen stains on cotton fabric, samples exposed to environmental insults, samples spiked with PCR inhibitors and cigarette butts. DNA yields for all sample types tested were equal to or better than both phenol/chloroform extraction method and commercial kits tested, especially for lower input amounts. Purified DNA was free of PCR inhibitors. The extraction method is suitable for manual and automated processing.

DNA Extraction, STR Profiling, DNA Isolation

146 An Automated System for the High-Throughput Processing of Differential Extraction Samples

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Differential extraction is the method by which spermatozoa are separated from epithelial cells present in sexual assault samples in preparation for STR amplification of the respective fractions. The technique in common usage employs a selective proteinase K lysis to liberate DNA from the epithelial cells of the sample while leaving the sperm heads intact. An initial centrifugation, following proteinase K digest, pellets sperm to the bottom of the digest tube. The supernatant is removed from the digest tube and retained for downstream processing as an epithelial fraction. The sperm pellet is then subjected to a serial washing process by which residual epithelial DNA-containing supernatant is gradually diluted and removed. The sperm pellet is then treated with a second digest step in the presence of dithiothreitol (DTT) as a reducing agent to liberate sperm DNA for downstream processing as the sperm fraction.

Each round of the pellet washing process requires the manual removal of supernatant, addition of pellet wash buffer, and agitation of the sperm pellet followed by centrifugation to reestablish the sperm pellet. One of the core limitations of this method is that it is both time and labor intensive. This is compounded by the fact that an analyst can only process a small number of differential extractions at a time. Additionally, the technique of removing pellet wash buffer from an unrestrained sperm pellet presents the analyst with the subjective decision of whether to comprehensively remove epithelial DNA from atop the pellet or to conscientiously preserve sperm heads in the pellet itself. Consequently, the technique is highly dependent upon analyst experience and the quality of result can vary greatly from analyst-to-analyst.

The Automated Differex TM System is a new application of Promega's Differex TM reagent kit that allows for the high-throughput performance of differential extraction. The application uses the reagents from the Differex TM and DNA IQ TM system kits in a novel way to achieve separation of sexual assault samples into sperm and epithelial fractions.

The starting point for Automated Differex TM separation is a plate of sperm pellets and epithelial digest supernatants resulting from an initial proteinase-K digest and centrifugation in a SlicPrep96 $\text{\textcircled{R}}$ apparatus. Once placed onto the deck of a robotic liquid-handling workstation, the epithelial-fraction supernatants are removed to an adjacent plate well. Automated Differex TM then utilizes DNA IQ TM Resin paramagnetic particles as part of a pellet-capping process. DNA IQ TM particles are added to the sample plate and a magnetic field is applied to form a pellet-capping layer atop the centrifugal pellet to restrain sperm bodies. This allows for secure sperm-pellet washing on the deck of an automated workstation. After washing, Differex TM Separation Solution is used to float the majority of residual epithelial DNA-containing pellet wash buffer away from the pellet, where the supernatant can be removed without disturbing the sperm pellet. A DTT sperm-lysis step liberates sperm DNA from the pellet. Both sperm and epithelial fractions of each sample then undergo DNA IQ TM automated nucleic acid isolation.

The Automated Differex technology's pellet-capping process allows for the uniform and high-throughput processing of differential extraction separations. The incorporation of DNA IQ TM technology into the Differex TM system results in high-quality nucleic acid purification from both sperm and epithelial fractions. The availability of an automated differential extraction method moves forensic sample processing one step closer to a fully integrated and automated way of moving from sample to analyzed result.

Data will be presented illustrating the ability of the Automated Differex TM System to resolve sexual assault mixtures, demonstrating the system's sensitivity and quality of separation. A detailed description of the automated methodology will also be presented.

Differential Extraction, High-Throughput Automation, Forensic Science

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139 A DNA-Based Multiplex Screening Tool for Separation of Fragmented and Commingled Skeletal Remains

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Mass graves and mass disasters present law enforcement officials and forensic scientists with the daunting responsibility of identifying victims and returning the remains to their respective families. However, the human remains in such scenarios are often severely fragmented, scattered, and/or commingled, and initially determining the number of victims present and separating the remains is an arduous, challenging task. Furthermore, although DNA-based identity testing is a powerful tool for victim identification, it is costly and labor-intensive. Attempting to obtain complete genetic profiles from every single fragment is time-consuming and exceedingly expensive.

To make the most efficient use of time and resources, a DNA-based screening tool could be used early in the investigation in order to separate the fragmented/commingled remains and hence determine a minimum number of victims present. The screening tool proposed here will incorporate a few genetic loci that show high variability in the human population, giving it sufficient discriminatory power for separation of the remains. Specifically chosen for the multiplex design are the amelogenin sex-determining locus, the non-coding STR tetranucleotide locus D3S1358, and a 3' CA dinucleotide repeat in the mitochondrial D-loop. A multiplex of these three loci would provide investigators with a quick, convenient, and relatively easy way to initially assess casualty numbers and separate remains for further DNA testing and positive identification.

This presentation will detail the results of experiments involved in the PCR optimization process of the multiplex including primer sequences for each locus, PCR reaction mixture concentrations and annealing temperature studies. The study was divided into two main phases, Phase I and Phase II. Phase I was the optimization of single loci amplification and experimental procedures. Phase II was concerned with combination biplex and the final triplex reaction conditions. The following table outlines the finalized PCR reaction mix for the triplex:

Table 13: Phase II PCR Master Mix Protocol for Multiplex Amplification of the mtDNA CA Repeat, Amelogenin, & D3S1358 (25 μ L total reaction volume)

2 μ L MgCl ₂ (25 mM)
1 μ L dNTPs (25 mM)
2.5 μ L PCR reaction buffer (10X)
2.5 μ L BSA (0.16 μ g/ μ L)
0.5 μ L Taq Gold™ DNA polymerase (5 U/ μ L)
1.0 μ L <i>Amelogenin</i> Forward Primer (10 μ M)
1.0 μ L <i>Amelogenin</i> Reverse Primer (10 μ M)
1.0 μ L <i>D3S1358</i> Forward Primer (10 μ M)
1.0 μ L <i>D3S1358</i> Reverse Primer (10 μ M)
1.0 μ L <i>CA Repeat</i> Forward Primer (L00484) (5 μ M)
0.5 μ L <i>CA Repeat</i> Reverse Primer (H00537) (10 μ M)
10 μ L molecular grade H ₂ O
1 μ L DNA (1 ng/ μ L)

The discussion will include various population studies for each loci, Discrimination Probabilities for the triplex, possible additional and/or substitute loci and detection platforms.

PCR, Multiplex, DNA

362 The STR Profiling of Human Tissues Fixed In Unbuffered Formalin

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Formalin fixed and paraffin embedded tissue block or stained sections are important personal archival material saved by pathology department of hospital or institution of forensic medicine. They were frequently submitted as a kind of vital evidence material to DNA detecting for the purpose of individual identification. It is accepted that available DNA extracting from these kinds of specimen very difficult because of the DNA damage occurred in a series of prepared process such as formalin fix ,ethanol dehydrate, xylene clarity ,paraffin embed ,slice up and pigment dye, etc. The paper focuses on these kinds of archival material and the aim is to assess their availability in DNA analysis. Various human tissue samples were taken at autopsy and cut to a size of 3x3cm, immersed in unbuffered formalin at room temperature and sampled. The DNA was extracted by DNeasy tissue kit (QIAGEN) and DNAIQTMsystem (PROMEGA)

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protocol. The last elution volume of 100 μL DNA was quantified and qualified by Real-Time PCR. Concentration 1-2 $\text{ng}/\mu\text{L}$ of DNA was amplified and genotyped by AmpFISTR identifier 16 loci and Minifiler 9 loci. The results were as follow: a) DNeasy protocol of DNA extraction is more efficient than IQTM system protocol on both DNA yield and STR profiling, especially in those samples that have been highly degraded by formalin and inhibited by pigment. b) Various human tissues have different repellency to formalin fixatives. The time limit showing complete STR profile for lung and ovary is ten days; for brain, heart, spleen, kidney, liver, stomach and uterus is seven days; and for intestine is four days. It is concluded that all formalin fixed tissues selected here were available for STR profiling within four days by DNeasy protocol. c) The successes rate of STR profiling for paraffin embedded tissue block depend on mainly the duration of previous formalin fix. During storage of paraffin blocks, DNA degradation may continue at a low level. When sampling, the tissue section of 5 μ sufficient for analysis. d) The paraffin embedded tissue sections, stained with haematoxylin eosin (H.E.), showed complete STR profiles by DNeasy extraction protocol, but failed by IQTM system extraction protocol.

Unbuffered Formalin, Degradation, DNA Extracting

118 The Stability of DNA Extracted From Bones by Developed Silica-Based Method

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Extraction nuclear DNA from bone remains is a key problem of individual identification in mass disasters and historic cases. However, many factors could influence the success rate of DNA isolation and amplification from forensic bones, especially the preservation environments, preservation time and isolation method. Our study primarily focused on assessing the stability and utility of developed silica-based method for DNA recovery in different preservation environments, preservation time and isolation part.

A simple and effective protocol was described here for amplifiable nuclear DNA from the forensic bones ranged from 0.25 year to 60 years. The bones were derived into five groups according to the preservation environments and preservation time. According to the preserved condition, the bones derived into five groups: fresh bones (group 1, NO.1~12, 0.25~10 years), strong alkali treated bones (group 2, NO.13~44, < 10 years; group 3, NO.45~66, 10~20 years; group 5, NO.67~73, >20 years) and buried bones (group 5, NO.74~86, >60 years). The developed silica-based method was validated on these groups and the nuclear DNA was genotyped by PCR-ASO. Comparison of DNA quantity and quality among different preserved conditions and preserved time was carried out by Kruskal Wallis method; the quantity and quality of protein was analyzed by ANOVA method.

The DNA quantity of fresh bone reached to 129.17 \pm 32.60 $\mu\text{g}/\text{mL}$ in group 1, which was the highest among all of the groups. The quantity decreased sharply from 61.00 \pm 26.00 $\mu\text{g}/\text{mL}$ to 31.43 \pm 10.29 $\mu\text{g}/\text{mL}$ with the increasing of preservation time in group two to four which were treated with strong alkali. The success ratio of genotyping also declined from 65.7% to 0% in groups two through four. Although the bones in group five had longest preservation time underground, the quantity (72.69 \pm 6.97 $\mu\text{g}/\text{mL}$) was higher than that alkali treated bones in groups two through 4. The A260/280 values of nuclear DNA all located between 1.6 and 1.8. The comparison of different preservation environment and preservation time showed the DNA quality presented significant difference among groups with different preservation time and preservation conditions ($p=0.000 < 0.05$), especially the latter factor influenced the DNA quality greatly. At the same time, the protein quality in five groups was analyzed by the ANOVA method, and no difference was observed among these groups ($p=0.100 > 0.05$).

The DNA degraded rapidly during the first two years after death, with some of the large segments decomposed into small segments, but still had enough DNA for analysis. Preservation time has little influence to DNA stability, but the preservation environment had great impact to it. The nuclear DNA in the strong-alkali group bones could be isolated and analyzed maximum to 12 years and with the increasing of preservation time, the quantity and quality of DNA decreased sharply. The studies thus demonstrated this developed protocol was convenient and could obtain high quality nuclear DNA effectively. The bone near metaphysis was the most suitable part to extract DNA in bones. Generally, modified protocol had many advantages: a faster operation, a lower cost, a higher DNA quality, as well as a greater DNA quantity. In addition, this protocol involved neither hazardous reagents nor special devices through out whole procedures.

Silica-Based Methods, Nuclear DNA, Bones

201 Study on the Construction of D2S1338 Allelic Ladder

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Short tandem repeats (STRs) are important genetic markers and widely used in forensic community because of their characteristics and advanced examine techniques. Allelic ladder is important part of STR kit and ensure the precise genotype of allelic. However, mostly STR kits used in DNA laboratory in China are bought from foreign company. In order to produce domestic STR multiple-color fluorescent kits, we choose D2S1338 locus to study on the construction of allelic ladder because which has high polymorphism and good genotype distributions. First, 13 D2S1338 allelic PCR amplified fragments were isolated from the non-denaturing polyacrylamide gel, eluted into DDW, and re-amplified. Then the purified allelic fragments were individually connected with pGM-T plasmid vector. The recombinants

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were transformed into the component E.coli DH5a cells. The next step was to identify and sequence the size and the structure of the inserts. Finally, the 13 recombinants plasmid DNA were used as templates for PCR amplified to produce D2S1338 allelic ladder. With the allelic ladder, the genetic polymorphisms of D2S1338 locus in Chinese Han population in Beijing were studied. The results demonstrate that the allelic ladder produced by this method is effective and practical, which can preserve allelic stability and resolve the problem of accuracy and standardization of STR genotyping in forensic. The results also demonstrate D2S1338 locus is useful marker for forensic science application.

Short Tandem Repeat, Clone, Allelic Ladder

272 Validation of Luminol as Technical Detection in Blood Stain on Different Media and Under Different Operating Environment for Forensic

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The objective of this research is to validate luminol as a forensic bloodstain detection tool and to establish its quality parameters. Luminol meets the quality parameters required for forensic work.

The purpose of this study was to validate luminol as a forensic technique. Human bloodstains obtained from voluntary donors were created on various surfaces. Stains were exposed to different environmental conditions (outdoors, indoors, and underground), periods of time (24 hours, one week, and one month), and temperatures (-20°C, 4°C, 37°C y 60°C). Other stains were washed with different treatments, until negative results were obtained with luminol. Dilutions of 1:10 were made to establish luminol's detection level. Potential interference with substances that may give false positive results were tested. Precision (repeatability, reproducibility, consistency rate, and Kappa index), detection limit, sensitivity, and specificity were evaluated.

The study found that luminol is capable of detecting bloodstains exposed to different environmental, temperature, time, and surface conditions. The following detection limits were established: 11 washes with water and bleach, 12 washes with water and soap, and 13 washes with water. Sensitivity was 1:10,000. No interferences were found with other substances. A consistency rate of 100% was determined, as well as sensitivity and specificity rate of 100, positive and negative predictive value of 1, and Kappa index of 1.

Conclusions:

1. Luminol is capable of detecting bloodstains exposed to different environmental, time, temperature, and airing conditions.
2. Luminol detects bloodstains, regardless of the surface.
3. This research shows that luminol is capable of detecting blood, even at a dilution ratio of ten thousand times.
4. Substances that interfere with luminol's blood detection capability were not identified.
5. Sensitivity and specificity rates of 100% were established.
6. This method provides the expert with information on optimal test conditions, sensitivity, specificity, and detection limits, as well as false positives and false negatives, which supports a legal argument.
7. The direct use of luminol on bloodstains does not alter the sample. Since it is not removed from its original support surface, the sample is not depleted. Consequently, the same bloodstain may be analyzed further.
8. Luminol detects small amounts of blood, particularly in cases where bloodstains are not visible to the naked eye.

This method is capable of detecting sparse bloodstains or stains that are not visible to the naked eye, without altering the evidence. Additionally, this is a highly sensitive, specific, and inexpensive technique that meets the quality parameters required for forensic applications.

Luminol, Blood Stain, Physical Evidence

150 Elimination Databases at the Institute of Environmental Science and Research, Auckland, New Zealand

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The DNA profiling techniques now utilized by Forensic laboratories can detect and generate full DNA profiles from individuals who may have deposited DNA onto a surface after sneezing, coughing, or touching the surface. The detection of such low levels of DNA has significant implications for those individuals who attend crime scenes, who are involved in crime sample collection and who undertake analytical processes within the laboratory. There is the possibility that an individual who is investigating a crime may inadvertently contribute his or her own DNA to the crime sample. This has been addressed by several laboratories through the development of Elimination Databases for crime scene attendants and laboratory staff.

In New Zealand the National DNA Databank is made up of two Databases, The National DNA Database (NDD) containing profiles from known individuals and the Crime Sample Database (CSD), containing unknown DNA profiles from crime stains for comparison against other crimes or the NDD. These are maintained by the Institute of Environmental Science and Research Ltd (ESR). If a DNA profile generated

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from a crime stain excludes a suspect who submitted a reference sample for comparison, or if there is no suspect for the crime, then that DNA profile will be entered onto the Crime Sample Database. There is the potential that a profile caused by an investigator may be undetected and entered onto the Crime Sample Database.

A Staff Elimination Database has been in use at ESR for a number of years, initially as a spreadsheet containing staff profiles which could be manually compared against DNA profiles derived from crime scene samples. As it was not always possible to check all relevant staff against all profiles (too many profiles and too many staff) there was a need to upgrade the system to an electronic filter system which can be compared against all crime sample results as they were produced and before they are loaded to the database. In addition, there was a need to develop similar elimination databases to store Laboratory Visitor/Contractor elimination profiles, Police elimination profiles and any profiles that may have been generated as part of the Laboratory Environmental monitoring program.

The development of the new electronic elimination databases involved consideration of consent and employment issues, in addition to the software creation. Extensive staff consultation was performed and guidelines for link investigations were developed to safeguard staff and visitors rights. Two different matching processes for the profiles on the Elimination Database were developed:

1. A filter for new crime sample profiles to pass through as they are produced, prior to loading to the CSD,
2. A retrospective search of the CSD to identify DNA profiles from staff unknowingly entered onto the CSD.

The software was developed within the current LIMS systems to address the different consent types and the different matching requirements. This presentation discusses the consultative process, the issues considered, and the development of the software requirements of the new Elimination Databases at ESR.

DNA, New Zealand, DNA Profiling

667 A Cold Hit...Relatively Speaking

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Autosomal Short Tandem Repeats (STR) linked a male DNA profile to the five victims. In 2003, the Louisiana Legislature provided the Acadiana Criminalistics Laboratory (ACL) with funding to conduct DNA analysis on any unsolved sexual assault case evidence in the ACL's possession. This was done in an effort to find a living sexual assault victim who might provide identifying information about the serial killer. The ACL had evidence stored in the form of cuttings and swabs dating back to 1985. The ACL determined that it had evidence from 317 unsolved sexual assaults in an 18 year period. The evidence from these cases was sent for analysis to three private vendor DNA labs. The private labs analyzed the samples and returned the data to the ACL. The analytical results were reviewed by the ACL for database suitability. Of the 317 cases, 90% had produced male DNA profiles suitable for entry into the COmBined DNA Index System (CODIS) database. Unfortunately, none of the profiles matched the serial killer. Eventually, a reference DNA sample was collected from Derrick Todd Lee. His DNA profile matched the male DNA profile associated with the five victims. He was subsequently tried and convicted of having committed two murders.

As a result of the 285 male profiles obtained from the unsolved sexual assault evidence and entered into the database, numerous sexual assaults were solved and several serial rapists were identified. One series of sexual assaults were discovered to have occurred in the city of Ville Platte, Louisiana. One male DNA profile was linked to five rapes that occurred from 1985 to 2001; however, the identity of the perpetrator was unknown. In October 2004, an investigator requested that the ACL examine another sexual assault case to see if it was the same perpetrator. The DNA profiles obtained from the samples in that case did not match the unknown male DNA profile from the five rapes; however, one reference DNA sample collected during the investigation of that case had five concordant loci with the unknown profile from the five sexual assaults. A sibship analysis showed that the unknown DNA profile from the five rapes was 3200 times more likely if the reference DNA sample was from a full sibling of the unknown DNA profile source rather than an unrelated individual selected at random. An investigation by the Ville Platte Police Department determined that the source of the reference DNA sample had five brothers. One brother was incarcerated in Texas on sexual assault and kidnapping charges; however, his DNA profile eliminated him as a suspect in the serial rapes. Another brother, Norman Wilson, was tested and his DNA profile matched the unknown DNA profile from the five rapes. Eventually, a sixth rape was linked to Norman Wilson through his DNA profile. Unfortunately, four of the six rape victims were deceased. One victim did not wish to pursue her case. Norman Wilson eventually pled guilty and was sentenced to prison for one count of rape. Other topics to be covered in this presentation include familial investigations of DNA profiles, the practicality of searching DNA databases for relatives, possible search guidelines for identifying potential relatives, and ethical considerations for identifying potential relatives.

Kinship, Siblings, STR

668 Development of Biological Resources for Pathogen Identification in Microbial Forensic Investigations

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The ability of an individual or group to use microorganisms and toxins as weapons poses serious concerns for the safety and security of both people and national assets. Criminal investigations involving biological agents are not new to law enforcement and forensic science analyses and can be useful for investigations, prosecutions, and exonerations. The need for a formal scientific discipline of microbial forensics crystallized after the 2001 anthrax attacks in the United States. If biocrimes are committed in the future, microbial

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forensic evidence will be sought, collected, and characterized. Such analyses are extremely demanding because identification of the signatures most useful for attribution requires substantial effort and microbial forensic specimens can be limited in quantity and/or quality. Improving law enforcement response against terrorist or criminal attacks involving biological agents necessitates timely and reliable access to relevant pathogens for criminal investigations. In addition, comprehensive collections of pathogenic microorganisms are needed for development of improved microbial forensics technologies. These collections are of particular importance for research, the development of diagnostic assays, and access to reference material for forensic comparisons. Validity and rigor are essential for demonstrating reliability of results produced by the tools of microbial forensics. Only validation can objectively demonstrate the inherent quality of a method or process and demonstrate its applicability for a designated purpose. Such objective performance data are essential for establishing confidence. A formal coordinated system of biological resources for forensically important microbes and toxins would improve threat agent monitoring and access control, as well as provide research and development tools. This system should be sufficient for appropriate development and validation of forensic and attribution methods, and provide an accessible microbial library to facilitate identification of potential pathogen sources during a forensic investigation. Many issues confront development of such a resource and formulation of an improved system for managing resources within the United States. Alternate approaches need to be weighed by stakeholders and decision makers so that development can take place in an informed manner.

Microbial Forensics, Microorganisms, Reference Material

105 The Effects of Scavenging by Native Animals on Decompositional Rates in Western Australia

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Estimates of time since death may be made from the state of decomposition of a body. While the influence of environmental conditions on the rate of decomposition has been well documented, the impact of scavenging on the timing of post-mortem decompositional changes remains relatively unquantified. The potential for errors in the estimation of time since death are of particular relevance in Australia, where low population densities and extensive areas of uncultivated bushland means that most human remains in the outdoors will remain undiscovered and liable to scavenging by both domestic and native animals for some time. There has, as yet, been no investigation into the effects of scavenging on decompositional rates in Australia. This study examines the effects of scavenging by native animals on the decompositional rates of pig carcasses deposited in a nature reserve in southwestern Western Australia, from which all large feral animals had been excluded. The most significant scavenger was the Australian raven *Corvus coronoides*, but direct feeding on the carcasses by brushtail possums, bungarra, and bobtail skinks was also observed. Brown honeyeaters and quendas fed on the insect material associated with the decomposing carcass. Rates of scavenging varied between seasons, stages of the reproductive cycles of the animals concerned, and other species present. Scavenging had the greatest impact on the duration of the later stages of decomposition. It affected the decompositional rate differently between seasons, having the greatest impact when decomposition was usually slowest.

Scavenging, Decomposition, Western Australia

163 The Application of Digital Imaging and Image Analysis to the Numerical Features of Hair in Forensic Hair Examination

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The advent of nuclear DNA (nuDNA) analysis altered the way forensic biology was both practised and viewed by the forensic biologists, police, the legal system and the general public^[1]. The ability of nuDNA to individualise analysis of evidence and attach a statistical frequency ratio to the result, created an expectation that numerical objectivity should be part of all forensic analysis. There are few scientists who would disagree with both the need and desirability of objective measures of their results. Forensic hair examiners are no exception as indicated by numerous scientific publications specifically discussing means of objectively assessing hair and its characteristics^[2, 3]. While mitochondrial DNA offers a partially objective measure of hair the result, is destructive of the sample. A method that objectively supports the hair analysts' microscopic findings and is non destructive would be beneficial to forensic hair examination. This project attempted to develop an objective measure of hair analysis by using both traditional light microscopic comparative techniques combined with a 'high end' digital imaging and image analysis capacity.

Where objectivity equals an empirical set of numbers that can be manipulated for statistical significance, the comparative biological sciences such as histology, anthropology and forensic hair examination, struggle. Forensic hair examiners have long acknowledged the difficulty, even inability, of assigning numerical values to the features that characterise one hair as being different from another. The human scalp hair is a 'morphological' unit that is not readily split into component parts or even that these parts lend themselves to a number value. There have been at least nine separate studies which favourably compare the specificity of microscopic hair examinations^[3]. The challenge

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this study addressed was to appraise the use of numerical features in forensic hair examination, with particular emphasis on those features currently resisting numerical evaluation; specifically, colour and pigmentary characteristics.

The techniques used were based on obtaining high quality digital images, and using the pixels inherent in the images to obtain numerical values of such features as colour and pigmentation. The project sample was taken from the telogen scalp hairs obtained from the hairbrushes of ten nominally brown haired Caucasians, both male and female. The focus was twofold:

- Compare colour analysis of hair images from brown haired Caucasians within three standard, internationally recognized colour models, namely Red-Green-Blue (RGB) colour model; CIE XYZ Tristimulus (1931) colour model; and CIE L*a*b* (1976) colour model.
- Using the same sets of digital images, undertake pattern recognition analysis both intra and inter individual hair samples.

Discriminate analysis of the mean colour values collected for each of the inherent colour variables in the three colour models (red, green, blue; X, Y, Z and L*, a*, b*) indicated the RGB colour model gave the least separation of brown haired individuals; CIE XYZ and CIE L*a*b* separated several individuals for all their individual samples and several other individuals were mostly separated with only one of their own samples overlapping with another.

Pattern analysis used a small area that represented the overall pigment patterning observed along the length of the hair shaft. This area was extracted from the digital image within V++ Digital Optics image analysis software. The extracted pattern piece was then compared with other sample images within the same hair and four other hairs from the same individual. Pattern extracts were also compared between person hair samples. The comparisons generated a set of numerical values based on the pixel number on the 'x' axis of the whole image and the average difference between the extracted pattern image and the whole image. Analysis of this data resulted in log distributions when persons were matched with themselves. It was also possible to refer an unknown pattern extract to this distribution and based on probabilities, predict as to whether or not the unknown sample fell within any of the known sample's distribution. References:

[1] Jeffreys, et al., 1985, Nature, 316, 76-79.

[2] Houck M.M and Bisbing R.E., 2005, Forensic Sci. Rev. 17, 51-66.

[3] Houck, M.M. and Budowle, B. 2002, J. Forensic Sci. 47, 964-967.

Digital Imaging, Numerical Features, Forensic Hair Examination

265 Morphologic Comparison Between Human and Domestic Animal Spermatozoa With the Use of Christmas Tree Coloration

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The objective of this research is to conduct a morphometric comparison of human and domestic animal sperm in order to establish the difference between both and to describe variations on different types of sperm stained with Christmas tree stain.

There are significant differences between human and domestic animal sperms. These differences will contribute to forensic case resolution.

Human ejaculates were collected through prostate massage. Domestic animal (bull, hamster, horse, dog, pig, and cat) ejaculates were obtained using artificial vaginas or prostate massage. Subsequently, smears were made, heat-fixed, and stained with Christmas tree stain. Smears were morphometrically analyzed under a motic 100x light microscope and motic images plus 200ml software.

Significant differences were found in the size and morphology of the sperm head and tail of the ejaculates of six groups of animals and one human. Stain retention on the heads and flagellates of different species varies. The intensity of the color observed on human nuclei is brighter. The stain occupies more than half of the head. Nucleus coloring in animal species is less intense and occupies less than one third of the head. The shape of the head of human, cat, and dog sperm is similar, but the size is different. Human, bull, horse, hamster, and pig sperms have different shapes. The size of animal sperm is significantly bigger than the size of human sperm. These differences help individualize the characteristics of each species.

Christmas tree stain helped establish the difference between sperms according to stain retention. The sperms analyzed for both animal and human species are morphometrically different. Therefore, their characteristics may be individualized. This avoids confusion between the two, which makes this method a valuable tool for sex crime cases.

Forensic analysis of samples recovered from sex crime scenes show that the presence of semen in a crime scene proves that a crime was committed. Sperms are one of the components of semen. These are specific cells that are preserved for a longer period of time and contain DNA. Human ejaculates have 200- 400 million cells. Therefore, semen is an important piece of evidence for prosecution.

The difference between human and domestic animal sperm is relevant to forensic cases. A criminal investigation may be oriented correctly. Although sex crimes are not usually associated to animals, it is important to distinguish between the morphometric characteristics of human sperm and domestic animal sperm. Domestic animals, e.g. Dogs, cats, bulls, horses, pigs, and hamsters are closely related to human beings. Therefore, the relationship between human beings and domestic animals could alter a piece of evidence that could determine the suspect's involvement or exclusion. Additionally, the purpose of this study is to establish guidelines for future investigations. Given that research in this area is limited, this is a starting point for the identification of the sperm found in forensic cases.

Spermatozoa, Morphologic, Human

186 Evaluation of Reliability of STR Typing in Human Colon Carcinomas Tissues Used for Identification Purposes

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The short tandem repeats (STRs) are highly polymorphic microsatellites and today are established tools in forensic applications. In paternity analysis, STRs are a fast and reliable approach and, therefore, used routinely in many laboratories especially since multiplex kits have been developed. Clinical tissue samples are not usually employed in forensic casework but can be used for identification of unknown bodies and paternity testing even if the putative father is dead. Sometimes, malignant tissue samples may be the only source of biological material for forensic investigations including identification of individuals or paternity testing. However, in use of such samples, uncertainties due to microsatellite instability (MSI) and loss of heterozygosity (LOH) often associated with neoplasias may be encountered. In this study, 99 colon carcinomas tissues, in parallel with control samples were screened for the 21 STR loci of the AmpF!STR® Identifiler® PCR Amplification Kit, Sinofiler Kit, and FFFL kit to provide further data useful to evaluate the applicability on cancerous tissues of STRs used in forensic field.

Genomic DNA was extracted from fresh tissue blocks and normal tissues by Chelex100 extraction protocol. LOH was assessed by polymerase chain reaction (PCR) analysis of the matched pairs of normal and tumor DNA with polymorphic microsatellite markers. Resulting PCR products were detected by capillary electrophoresis (ABI 310). Loss of one allele of a polymorphic marker or a very strong decrease in signal intensity of one allele intumor DNA was considered as evidence for LOH. MSI was identified when novel alleles of microsatellite markers appeared intumor DNA compared to the matching germ line DNA.

Four kinds of changes between normal and tumor tissue were found: partial loss of one allele (pLOH), complete loss of one allele (LOH), occurrence of an additional allele, and occurrence of a new allele instead of that found in normal tissue. A total of 37 (27%) showed occurrence of an additional allele, three (2%) showed occurrence of a new allele when compared with the corresponding normal tissues; 14 (10.2%) showed complete loss of one allele (LOH), 83 (60.2%) showed partial loss of one allele (pLOH). The loci most frequent lowest audible tone were FGA, D5S818, D18S51, and D13S137. The lowest frequency of LOH could be detected for TPOX, TH01, and D2S1338. These results suggest that great care should be taken in the evaluation of the DNA typing results obtained from clinical cancerous specimens when no other reference samples containing normal tissue are available.

Partial loss of one allele (pLOH), on several genetic loci is a common phenomenon, suggesting further studies are necessary to identify threshold of pLOH. Great care should be taken in the evaluation of typing results obtained from clinical tissue specimens, in particular when no reference samples are available, because genetic instability is a very common event observed in different tumors and the STRs used for individual identification could sometimes be affected.

Colon Carcinomas Tissue, Short Tandem Repeat (STR), Micro-Satellite Instability (MSI)

145 Developmental Validation of a Real-Time PCR Assay for the Quantitation of Total Human and Male DNA

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Multiplexed Short Tandem Repeat (STR) analysis has become the dominant technology in DNA-based human identification. Although highly informative, these assays require a defined range of template quantity to produce optimal results. In addition to accurate sample quantitation, simultaneous assessment of sample quality and highly sensitive detection are necessary to fully answer the question of how best to proceed with sample analysis.

Quantitative PCR has displaced hybridization-based methods for human-specific quantitation. This change has reduced the rate of false negative results (due to lack of sensitivity) and increased the objectivity of data interpretation (numerical output rather than visual comparison of band intensities). However, some current qPCR methods do not allow simultaneous quantitation of total human and human male DNA as well as sensitivity that consistently exceeds that of the subsequent STR assays.

The Plexor® System, a quantitative PCR method, has been developed using the specific interaction of two modified nucleotides. One of the PCR primers includes a modified nucleotide, iso-dC, adjacent to a fluorescent label on the 5' end. The second PCR primer is unlabeled. The reaction buffer includes the complementary iso-dGTP, which has been modified to include dabcyI quencher. Incorporation of the dabcyI iso-dGTP adjacent to the fluorescent dye reduces signal that allows quantitative data to be obtained. Multiple targets can be simultaneously detected through use of a different fluorophore for each target. The non-destructive nature of this approach permits melt/dissociation analysis of amplified products. This post-PCR analysis can compare similarity of the amplified sequence between the standards and unknowns, providing a useful quality confirmation.

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The Plexor® HY System is a multiplex assay that has been developed for the simultaneous quantitation of total human DNA and human male DNA. An internal PCR control (IPC) has been included to monitor inhibition in the quantitation process. This assay uses three dyes to detect amplification and a fourth dye to provide a passive reference signal. The autosomal target is a multicopy 99bp target on chromosome 17. The Y-chromosomal target is a multicopy 133bp target on the short arm of the Y-chromosome. The IPC target is a synthetic sequence added to all wells. The amplified IPC is 150bp, the longest amplicon in the assay.

Associated Plexor® Analysis Software has been developed to visualize amplification data from multiple instrument platforms, plot standard curves and calculate DNA concentrations of unknowns. An STR normalization module has been built in to the software that, with simple user inputs, allows the software to a) compute sample input volumes required for amplification in autosomal and Y-STR reactions, b) calculate necessary dilutions for concentrated samples and c) flag low quality and inhibited data. Protocols for use with the Applied Biosystems 7500 and 7500 FAST Real-Time PCR Systems and the Stratagene Mx3000P® and Mx3005P® QPCR Systems have been developed. A discussion on use with other instrumentation will also be presented. In addition to analysis software, development of automated methods for qPCR set-up, DNA normalization and STR amplification set-up will be described.

Data will be presented demonstrating the performance of this assay and the interface of the analysis software. Developmental validation studies include:

- a) within run and between run reproducibility,
- b) Y-assay male specificity,
- c) human specificity (non-human DNA analysis),
- d) post-quantitation normalization and STR amplification,
- e) inhibitor impact and purification method studies,
- f) concordance with existing quantitation systems including non-probative samples,
- g) quantitation of degraded DNA,
- h) male/female mixture studies and
- i) interlaboratory comparisons.

DNA Quantitation, Real-Time PCR, Forensic Science

176 Utility of the Quantifiler® Duo DNA Quantification Kit in Forensic Case Work

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Forensic evidence samples vary largely within sample types, and exposure to environmental insults, contamination with PCR inhibitors often limit the available quantity of DNA. Isolation of DNA from forensic evidence samples, therefore, can be challenging, and this creates bottlenecks in the sample processing workflow. The presentation will discuss the development of a genomic DNA extraction method that enables lysis of various sample types, removal of PCR inhibitors and high recovery of DNA, particularly from samples that contain low quantities of DNA. The method employs a proprietary chemistry for sample lysis, and magnetic particles for purification of DNA. The validation studies were performed following the revised validation guidelines provided by the Scientific Working Group on DNA Analysis Methods (SWGDM). Quality of the DNA extract was evaluated for down stream applications such as real time PCR using the Quantifiler kits and STR profiling using the AmpF!STR® Identifier®. STR profiles obtained from compromised samples were devoid of any PCR artifacts. Performance of the developed method for extraction of DNA was compared to the traditional phenol/chloroform method and several commercially available kits. Sample types investigated include liquid blood, blood stains on denim, cotton fabric and FTA paper, buccal swabs, liquid saliva, saliva stains on fabric, semen stains on cotton fabric, samples exposed to environmental insults, samples spiked with PCR inhibitors and cigarette butts. DNA yields for all sample types tested were equal to or better than both phenol/chloroform extraction method and commercial kits tested, especially for lower input amounts. The purified DNA was free of PCR inhibitors. The extraction method is suitable for manual and automated processing.

DAN Quantification, STR Profiling, Real Time PCR

142 Validation of Two DNA Quantification Methods in Various Forensic Testing Conditions

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Human DNA quantification is used to determine the amount of DNA present in unknown samples. DNA quantification of forensic samples determines the optimum amount of sample required to obtain PCR reactions. If amounts larger than those recommended are used, signal unbalance may result in loss or non-detection of the signals produced by larger systems. A similar situation may occur when low DNA sample concentrations are added, which results in allelic loss in some systems or non-amplification in others. Therefore genotyping results are unreliable.

Molecular genetic analysis of forensic samples is significantly affected by some factors, such as small amounts of recovered DNA or the presence of PCR inhibitors. Consequently, new extractions or additional genotyping or PCR reagents are required to obtain results. The use of reagents, samples, and time increases significantly. Thus, forensic labs must have highly reliable DNA quantification techniques in order to minimize genotyping errors, unnecessary waste of reagents, and sample reprocessing time.

The method used by Applied Biosystems' Quantifiler Human and Quantifiler Y Human Male kits is Real Time Polymerase Chain Reaction (RT-PCR), through ongoing monitoring of the whole reaction.

Real Time-PCR has eliminated many of the problems posed of quantification methods, i.e. specificity, sensitivity, and use on different types of forensic tissue, such as bone samples. It has become the preferred DNA quantification method, due to its high sensitivity, easiness, and good results obtained with various types of forensic samples.

One hundred and eleven DNA samples obtained from different types of forensic samples were analyzed as follows: reference blood samples on various media, bloodstains recovered at the crime scene, postcoital samples, semen stains, hair, epithelial cells recovered as evidence, and muscle, teeth, and bone samples.

DNA quantification results were compared to genotyping results of the samples analyzed. Both results were consistent, i.e. the DNA concentrations obtained in every case were related to their genotyping signals.

The results obtained in 28 different types of samples following the manufacturer's protocol were also compared to the results obtained when the reagent volume is reduced by half. No significant differences were found between these two variables.

Finally, the sensitivity of the Quantifiler Human and Quantifiler Y Human Male kits was verified using different cell lines included in the nuclear STR amplification kits in concentrations of 0.1 ng/μl and 10 ng/ μl, according to the manufacturer. However, the quantification results obtained were higher than those reported for these cell lines.

The purpose of the study was to validate this methodology and the DNA quantification kits based on samples recovered from actual crime scenes. These are the samples routinely received by forensic labs.

DNA Quantification, Real Time PCR, Method Validation

227 Different Effects of PCR Inhibitors on Multiplex STR Assays

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DNA samples recovered from crime scenes are often commingled with contaminants that present a significant challenge for PCR amplification. Outdoor crimes may leave body fluids such as blood and semen on soil, sand, wood or leaf litter that contain substances which can co-extract with the perpetrator's DNA and prevent PCR amplification. Textile dyes, leather, and wood from interior crime scenes can also contain inhibitors that interfere with the DNA polymerase's activity. The impact of these contaminants on the multiplex STR assays can vary from attenuation to complete inhibition of the amplification process, resulting in partial STR profiles or profiles with unusual peak morphology.

In the present study, a systematic approach was utilized to evaluate the effect of six PCR inhibitors commonly found in forensic samples on different multiplex PCR assays. Each multiplex PCR assay has unique primer sequences and buffer formulation. The six PCR inhibitors used in the study were hematin, indigo, melanin, humic acid, collagen, and calcium. For each multiplex PCR reaction, a range of inhibitor concentrations was included during PCR amplification. The amplification results were evaluated based on: 1) the ability of each multiplex PCR assay to generate full STR profiles, and 2) the quality of the STR profiles obtained.

The results revealed that the STR profiles obtained from multiplex PCR assays can be severely compromised by various PCR inhibitors. Within the same multiplex PCR assay, the degree of inhibition varies greatly with different types of PCR inhibitors. Between different multiplex PCR assays, the tolerance to PCR inhibitor also differed considerably. The results clearly indicated that with optimal primer sequences and buffer formulation, PCR inhibition can be kept to a minimal. Furthermore, the results also demonstrated that PCR cycling conditions can influence the peak morphology of the PCR-inhibited samples.

STR Typing, MiniSTR, PCR Inhibition

Forensic Biology, DNA Profiling, and Serology

358 STR Database in the Chinese Nations From China

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Tandemly repeated DNA sequences are widespread throughout the human genome and show sufficient variability among individuals within or between populations and have become significant in several fields including genetic mapping, linkage analysis, and human identity testing. These tandemly repeated regions of DNA are typically classified into several groups depending on the size of the repeat region. Minisatellites (variable number of tandem repeats, VNTRs) have core repeats with 9-80 bp, while microsatellites (short tandem repeats, STRs) contain 2-5 bp repeats. National Chinese Bio-information for STR Database is based on a high degree of discrimination among individuals in the populations obtained when multiple STR loci are examined in the Chinese nations. The relevant data from 934,000 STRs in total from 55 Chinese nations of the 44 most frequently used STR loci, including 13 autosomal STRs, 14 X-chromosome STRs and 17 Y-chromosome STRs, and corresponding original sample information is contained in the current version of the database. It was designed to respond to inquiries from Chinese nations has to the frequency of occurrence of original STR results of allelic, genotype and haplotype testing. It could also serve as the calculator of population genetics indicators. The achievement of the database will provide significant supports to the collection, preservation, and standardization research of Chinese nations STR data. Facts and sequence information on each STR system, population data, commonly used multiplex STR systems, PCR primers and conditions, and a review of various technologies for forensic analysis of STR alleles have been included in this database.

Chinese Nation, Short Tandem Repeats (STRs), Database

408 Genetic Analysis and Phylogenetic Relationships of Chinese Populations Using Y-STRs

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China is a large country inhabited by a number of ethnically diverse populations. The Han people make China's and the world's largest ethnic group, making up 91.96 percent of the country's population. The population of the other 55 ethnic minority groups adds up to 8.04 per cent of China's population. Although small in number, the peoples of the various ethnic minorities which live both mingled together and as separate compact communities inhabit 50 to 60 percent of the country. In this study, four minority populations of China were studied in order to enrich Chinese ethnical genetic population informational resources, and provide population-specific reference databases for forensic practice and human evolution.

Allele frequency distributions and haplotype data for 11 Y-chromosomal STR loci DYS19, DYS385, DYS389I, DYS389II, DYS390, DYS391, DYS392, DYS393, DYS437, DYS438 and DYS439 included in the PowerPlex Y Systems were investigated in a total of 974 unrelated autochthonous male individuals from four Chinese ethnic minority compact communities: Manchu (n=275), Hui (n=204), Xibe (n=280), and Tujia (n=215). Pairwise values of distance matrix (Rst) were calculated to measure genetic distances between previously published extended haplotypes (ExtHt) data on twenty other populations (6 Chinese minorities, 12 Han Chinese, South Korea, and Japan populations, n = 3,927) by using ARLEQUIN software Version 3.000. A neighbor-joining tree was constructed from the pairwise Rst using the relevant programs in PHYLIP and viewed using the program TREEVIEW to illustrate the relationship between populations. A multidimensional scaling analysis (MDS) based on the pairwise Rst values was performed using the software package STATISTICA. In population comparisons, DYS437 was not considered and the number of repeats in DYS389I was subtracted from DYS389II.

Ethnic Minority	# of Haplotypes	Haplotype Diversity	Discrimination Capacity
Manchu	238	0.9917	0.7685
Hui	187	0.9990	0.9167
Xibe	237	0.9984	0.8464
Tujia	195	0.9942	0.9070

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AMOVA tests revealed that variation among individuals within population and among populations were 92.22 and 7.78% ($P < 0.0001$), respectively, and demonstrated significant genetic heterogeneity in nearly all comparisons of the four ethnic minorities and twenty reference populations, justifying the establishment of local databases in these four ethnic groups for forensic practice. In both neighbor joining tree built from the Rst distance matrices and multidimensional scaling analyses all Chinese ethnic minority populations are separated from all 12 tight clustering of Chinese Han populations. Manchu ethnic appears closest to the Han populations; somewhat closer are Xibe ethnic, and Hui ethnic, whereas Tujia, Tibetan, and the Uygur are the furthest distant. Chinese Korean ethnic group has a vicinity to geographical neighboring populations from South Korea and Japan.

Genetic heterogeneity based on Y-STR "ExtHt" haplotypes generally correlates well with the geography and history of the studied populations. In conclusion, our data are consistent with the assumption of heterogeneity of present-day paternal lineages within China and their distinctiveness from other parts of Asia, at least in respect to their Y-STR haplotypes.

Y-chromosomal STR, Haplotype, Chinese Ethnic Minority Group

66 Genetic Population Analysis of 17 Y-Chromosomal STRs in Three Departments (Valle del Cauca, Cauca, and Nariño) From Southwestern Colombia

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In this study, seventeen Y-chromosomal (DYS19, DYS389 I/II, DYS390, DYS391, DYS392, DYS393, DYS438, DYS439, DYS437, DYS448, DYS456, DYS458, DYS635, YGATA-H4 and DYS385a/b) short tandem repeat (STR) polymorphic systems were typed by PCR multiplex reaction in three South Western Colombian populations: Valle, Cauca, and Nariño. DYS385a/b showed the highest gene diversity of the three populations. A total of 288 different Y-chromosome haplotypes were observed in 309 males analyzed, and the haplotype diversity among populations was 0.999. The most frequent haplotype was repeated only three times and nineteen were repeated two times. The highest average gene diversity was found in Valle and the lowest in Cauca. This study provides further information on the Y-chromosome polymorphisms commonly used in paternity testing, forensic genetics, and population genetic studies.

Blood samples were obtained from reportedly unrelated healthy donors who were born and living in the Colombian South Western states of Valle, Cauca, and Nariño. Subjects were selected among individuals who participated in paternity tests. Amplification of the 17 Y-STR loci was performed using the AmpFISTR® Yfiler™. Allele designation was performed according to ISFG recommendations on forensic analysis with Y-chromosome STRs using the commercial allelic ladder of the Y-File system. Haplotypes were determined by means of Excel matrix and several statistic parameters were calculated using ARLEQUIN software ver.2000: variance by AMOVA, gene frequencies, and gene/haplotype diversity values.

A total of 288 different Y-chromosome haplotypes were observed in 309 males from three populations. The most frequent haplotype (14-13-17-14-32-23-10-11-12-10-11-14-20-15-17.2-21-11) was repeated only three times, and nineteen others only two times. Allele frequencies of the systems and gene diversity values are shown in Tables 2 and 3. The highest diversity value in this study was found at locus DYS385 (0.983) followed by locus DYS458 (0.795). Haplotype diversity value among populations found in this study was 0.9995. The discrimination power was determined based on the number of individual haplotypes/total number of individuals analyzed. This value was 93.2%.

The three population samples "Valle [Mestizo]", "Cauca [Mestizo]" and "Nariño [Mestizo]" have been submitted to the Y Chromosome Haplotype Reference Database, YHRD and were assigned to the "Eurasian/European" metapopulation (PopSearch menu), defined as large pooled reference populations in the YHRD for calculating match probabilities in forensic casework. The Y-chromosome non-recombinant portion represents a paternally inherited haploid transmission pattern. Because Y-STRs can be employed to construct highly discriminative Y haplotypes, they are useful in stain analysis, paternity testing, and forensic genetics because of their male-specificity and in population genetic studies. From the evolutionary point of view, these markers are useful for tracing population migration and inferring the history of modern human beings. These markers allow amplification of male-specific DNA regions in a male/female mixture without female DNA competition for reagents during PCR. The gene frequencies and gene and haplotype diversity for 17 Y-STR loci reported here in three south western Colombian departments will increase the world database and the knowledge on local population polymorphisms.

DNA Typing, Y-STR, Haplotype

558 Analysis of the SE33 Hypervariable Microsatellite Locus (HumACTBP2) in Colombian Populations

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SE33 (HumACTBP2) is a hypervariable locus that has shown the highest discrimination values in the forensic area. SE33 has at least 30 frequent alleles and over 20 rare alleles in different populations where it has been analyzed. This survey followed the quality parameters recommended by the international forensic community for the validation of genetic markers as human identification tools. Population distributions were analyzed in 45 alleles detected in 640 individuals from two main ethnic groups in Colombia: Andean Mestizo and Afro-Descendants. Results showed that the population was consistent with the Hardy-Weinberg equilibrium and that the population genetic parameters of SE33 are useful as forensic markers, mainly for complex criminal identification and paternity testing.

Complex scenes both in terms of criminal identification and paternity testing in Forensic Labs, i.e. mixed DNA samples in sexual assault victims, human identification in mass disasters, kinship investigations where the father and/or mother are absent, or incestuous relationships are some particularly difficult forensic cases where the use of highly polymorphic markers is recommended (Olaisen *et al* 1997).

SE33 (HumACTBP2) is one of the most polymorphic and informative STR loci for paternity testing and human identification (Dimo-Simonin *et al* 1998). The repeat sequence is located in the 5' flanking region associated with pseudogene 2 of human beta-actin, mapped on 6q, which contains a microsatellite sequence composed of repeat tetranucleotide (AAAG)_n units (Warne *et al* 1991, Polymeropoulos *et al* 1992, Wenda *et al* 2005). According to the SE33 nomenclature recommendations of GEDNAP (Schneider *et al* 1998), repeats of AAAG motifs generate 10 simple alleles called with the same nomenclature: 11 to 20. Additionally, this shows a variety of complex alleles with the (AAAG)_n AG (AAAG)_n structure, recognized as type ".2" alleles: 20.2 to 40.2 (Warne *et al* 1991). Several population studies have detected almost 30 common alleles and over 20 rare alleles (Brinkmann *et al* 1996, Dauber *et al* 2004), which show one of the highest discrimination powers in human identification, as compared to traditional forensic markers. SE33 allele frequencies have been studied by forensic laboratories in European (Laszik *et al* 2001), Japanese, Chinese (Liu *et al* 1997), and North American populations (Reid *et al* 2003), but not in South American populations. Particularly, population studies conducted in Colombia do not include this marker (Mesa *et al* 2000, Bravo *et al* 2001, Acosta *et al* 2002, Yunis *et al* 2000, Vargas *et al* 2001, Paredes *et al* 2003). On the other hand, SE33 is included in two fluorescent multiplex kits recommended by the DNA Working Group of the European Network of Forensic Science Institutes (ENFSI): *SEfiler ABI® Kit* (Applied Biosystems) and *Power Plex ES® System* (Promega Corp).

This presentation will describe an optimized PCR protocol and SE33 locus typing using automated capillary electrophoresis with high reproducibility rates and without electrophoretic mobility defects previously reported, when no denaturing conditions were used (rothämel *et al* 2000). The population and forensic genetic parameters of two main ethnic groups in Colombia, Andean Mestizo and afro-descendants, are presented.

DNA was extracted from FTA card blood samples (1,2 mm fragments) of 640 unrelated individuals. Two Colombian populations with different ethnic background: afro-descendants (n=457) and Andean Mestizo (n=183) were included in the sample. Demographic data were collected during personal interviews.

Following a modified protocol from Polymeropoulos *et al* (1992) on a 9700 Perkin Elmer thermocycler, a 25 ul reagent mixture containing taq buffer 1x, mgcl₂ 1,6 mm, dntp's 0,15mm, primers 0,5 um each, taq DNA polymerase 1.2 u, and 0,5 – 5 ng of DNA template were used.

Se33 primer sequences: primer f: 5'fam-aatctgggcgacaagagtga-3' and primer r: 5'-acatctcccctaccgctata-3 (Dimo-simonin *et al* 1998).

Denaturation was carried out at 95°C for 5 min, then 32 cycles of 95°C (1min), 63°C (1min) and 72°C (1min), with an additional extension at 72°C for 10 min.

Detection of amplified products was carried out in an automated multi-capillary AB 3100 sequencer using performance-optimized polymer (pop4) and 47 cm capillaries. *Genescan collection* and *genescan analysis* software were used for typing analysis, with *genescan rox 500* as internal standard.

PCR products from 70 individuals with 34 different alleles were diluted 1:1, mixed and balanced to obtain an allelic ladder. The allelic mix was injected sixteen times on the same day and on different days to estimate protocol reproducibility. The precision of allele sizing was calculated using the following equation: % precision = (1 - sd / exp) x 100 (dimo-simonin *et al* 1998), where sd is the standard deviation of signal sizes observed for a given allele and exp is the theoretical allele size. Additionally, we calculated the power of the typing method to solve alleles separated by 1bp in accordance with Holgersson *et al* (1994).

Forensic Biology, DNA Profiling, and Serology

Sequencing was performed to determine the actual size of the selected alleles. The alleles from heterozygous individuals were run on agarose gels and in a 6% native PAG in 1 x TBE buffer, isolated from the gel and eluted in TE buffer, reamplified and then sequenced with the *big dye terminator v. 3.1 cycle sequencing kit® (ab)* on a abi310 genetic analyzer. The sequence process was made using *sequence scape™ software* with both se33 forward and reverse primers to check reproducibility results and compared with published data (*liu et al 1997, delghandi et al 2001*).

The gda - genetic data analyses v. 2002 (*weir 1996*) and arlequin excoffier software were used to estimate allele frequencies, to test the hardy-weinberg equilibrium (hwe) by exact tests (Guo and Thompson 1992), both observed and expected heterozygosity (*Nei 1978*), and fsts (Wright 1951).

Forensic parameters: power of discrimination (pd), matching probability (mp), power of exclusion a priori (ce), typical paternity index (tpi), mean likelihood ratio (Mlr), and polymorphic information content were calculated through conventional equations (*Jones, 1972, Botstein et al 1980*).

Results and Discussion: The maximum variations observed for any allele were 0.18 bp for the within-day and 0.45 for the day to day. The sds values ranged from 0.015 to 0.095 for the within-day and from 0.10 to 0.20 for the day to day. The mean precision (Mp) was 99.978% and 99.938%, respectively.

The sd observed between two alleles that differ by only one pb, included in the allelic ladder (17.3 -18 and 21 -21.1) was 0.0343 and 0.073, respectively. Size overlapping was not observed when 3sd was added to the minor alleles (17 and 21) or when 3sd was subtracted from the major alleles (18 and 21.1).

The previous reproducibility test shows that all se33 alleles observed in this survey were unambiguously detected by capillary electrophoresis, including alleles .2 and .1. Finally, a random sample of the 928 alleles taken from our population study showed a mean sd of 0.2643 pb (Mp=97,84%), within the three sd interval, 20 alleles (2.16%) showed sizes shorter than expected. Again, data showed high reproducibility of capillary electrophoresis to discriminate se33 alleles. These conditions avoid the abnormal electrophoretic mobility observed in non-denaturing acrylamide gels (*rothämel et al 2000*). Sequencing analysis

Alleles with lowest frequencies were confirmed by sequence analysis. Additionally, we sequenced 10 common alleles. The sequences obtained (data are not shown) correspond to the expected information: simple alleles showed a (aaag)_n pattern and complex alleles showed an (aaag)_n ag (aaag)_n pattern, including both 2 or 3 nucleotides in the repeat sequence (.2 or .3 alleles respectively), (*Schneider et al 1998*). This information allowed for validation of the allelic ladder used to assign the bp size to the population data (*Moller et al 1995*).

Population genetic analysis: Demographic data show that over 95% of the people are natives of the area where they were sampled and over 85% of their parents and grandparents were born in the same location or neighboring towns. The previous trends allow us to state that the sample is representative of native populations and to infer a low migration rate among the main Colombian regions during the last three generations.

Figure 1 shows the ladder electropherogram built in this survey.

Forty-five and 219 different genotypes were detected in 640 individuals. These data show the high diversity detected in the populations of the study. The allelic frequencies obtained for the two predominant ethnic groups in Colombia are shown on table 1.

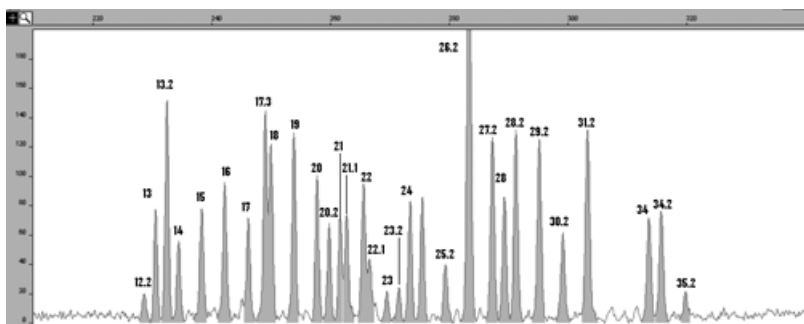


Figure 1. SE33 allelic ladder electropherogram

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Table 1. Allele frequencies for the humactbp2 (SE33) locus in the two main ethnic groups in Colombia

Alleles	Afro-descendants*	Andean Mestizo*	Colombia
8	0.0000	0.0028	0.0008
11	0.0011	0.0028	0.0016
11,2	0.0034	0.0000	0.0024
12	0.0023	0.0028	0.0024
12,2	0.0011	0.0028	0.0016
13	0.0068	0.0113	0.0081
13,2	0.0023	0.0000	0.0016
14	0.0259	0.0312	0.0274
15	0.0507	0.0368	0.0468
16	0.0643	0.0567	0.0621
16,2	0.0023	0.0000	0.0016
17	0.0755	0.0567	0.0702
17,3	0.0011	0.0028	0.0016
18	0.0958	0.1021	0.0974
18,2	0.0023	0.0000	0.0016
19	0.0857	0.0738	0.0824
20	0.0688	0.0595	0.0661
20,2	0.0079	0.0000	0.0056
21	0.0609	0.0227	0.05
21,1	0.0011	0.0000	0.0008
21,2	0.0113	0.0113	0.0113
22	0.0135	0.0170	0.0145
22,2	0.0068	0.0198	0.0105
23	0.0056	0.0057	0.0056
23,2	0.0169	0.0255	0.0193
24	0.0045	0.0028	0.004
24,2	0.0259	0.0368	0.029
25	0.0000	0.0028	0.0008
25,2	0.0473	0.0425	0.046
25,3	0.0011	0.0000	0.0008
26	0.0011	0.0000	0.0008
26,2	0.0643	0.0623	0.0637
27	0.0011	0.0000	0.0008
27,2	0.0598	0.0510	0.0573
28	0.0011	0.0000	0.0008
28,2	0.062	0.0935	0.071
29,2	0.0485	0.0737	0.0556
30,2	0.0271	0.0481	0.0331
31	0.0011	0.0000	0.0008
31,2	0.0271	0.0340	0.029
32,2	0.009	0.0028	0.0076
33,2	0.0011	0.0000	0.0008
34	0.0011	0.0028	0.0016
35	0.0023	0.0000	0.0016
35,2	0.0011	0.0028	0.0016
N	457	183	640

*Afro-descendants correspond to individuals from seven Caribbean states (Guairá, Córdoba, Bolívar, Atlántico, Magdalena, Sucre, and San Andrés) and the state of Chocó on the Pacific coast. *Andean mestizo corresponds to six states (Antioquia, Risaralda, Bogotá, Boyacá, Santander, Valle)

The genotypic frequency distribution meets the expectations of the Hardy-Weinberg model ($P=0,3219$). Observed and expected heterozygosity were similar to those reported by other studies (*Dimo Simonin et al 1998*) and are shown on Table 2. The F-statistics obtained to evaluate the population substructure indicate low genetic differentiation in the population of the study ($F_{st} = 0,0064$). Forensic genetic estimators were Match Probability (0.006), Power of Discrimination (0.994), and Chance of Exclusion (0.8223).

When analyzing SE33 locus in a population sub-sample composed of 48 true trios, an average paternity index of $ip = 20.0$ ($w = 0.9061$ with a range of 0.8367 – 0.9934) was observed. The most common w value was 0.895. In fifteen paternity cases where the father was absent, the average ip was 8.56 ($w = 0.8296$).

The minimum likelihood ratio calculated with the highest genotypic frequency was $lr = 1 / 0,0181 = 55,25$.

Table 2. Population and forensic genetic parameters for the se33 in two main ethnic groups in Colombia

Parameters	Afro-Descendants	Andean Mestizo	Colombia
Minimum allelic frequencies	0.0033	0.0082	0.0023
H_o	0.9326	0.9647	0.9417
H_e	0.9402	0.941	0.9407
HWE - Exact test	0.2154	0.9271	0.3219
PD	0.9937	0.9937	0.9939
CE	0.843	0.8422	0.8859
MP	0.0063	0.0063	0.0061
PIC	0.9397	0.9394	0.9408

Forensic Biology, DNA Profiling, and Serology

Ho: heterozygosity observed, he: heterozygosity expected, hwe: Hardy – Weinberg equilibrium – probability values of exact test based on 3200 shufflings, PD: power of discrimination, PE: power of exclusion, MP: matching probability, PIC: polymorphism information content.

Finally, the likelihood of two individuals with any combination of alleles selected from the 20 most frequent se33 genotypes being contributors to the genotype mix where is explained all the alleles present vs. The likelihood of the same genotype mix coming from two unknown individuals of the same population was = $1 / 0,000142 = 7042$.

In general, the efficiency of SE33 in solving complex forensic cases has proven to be useful for both forensic and paternity testing (*Betz et al 2007*). This study recommends the use of highly polymorphic loci, such as humactbp2 (SE33), as a tool to track down biological evidence, prior to routine DNA profiling in highly complex analyses.

Acknowledgements

The authors acknowledge the Colombian National Institute of Legal Medicine and Forensic Sciences and in particular the Scientific Research Division and the Forensic Genetics Team for their methodological support.

This research was funded by the National Institute of Legal Medicine and Forensic Sciences and administered by COLCIENCIAS, Project 377-2004. Forensic Genetics Team. National Institute of Legal Medicine and Forensic Sciences, Colombia - Calle 7ª No. 12 – 61 tel. _57-1-3334850 ext 144 Bogotá – Colombia mparedes@uniandes.edu.co

SE33 (HumACTBP2), Hypervariable Microsatellite, Colombian Genetic Population Data

354 HLA-A, B, and DRB1 Gene Polymorphisms in Hui Ethnic Group of Ningxia Province From China

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HLA-A, HLA-B belongs to the HLA class I heavy chain paralogs. This class I molecule is a heterodimer consisting of a heavy chain and a light chain (beta-2 microglobulin). The heavy chain is anchored in the membrane. HLA-DRB1 belongs to the HLA class II beta chain paralogues. The class II molecule is a heterodimer consisting of an alpha (DRA) and a beta chain (DRB), both anchored in the membrane. Class I and II molecules play a central role in the immune system by presenting peptides derived from the endoplasmic reticulum lumen. They are expressed in nearly all cells. DRB1 is expressed at a level five times higher than its paralogs DRB3, DRB4, and DRB5. DRB1 is present in all individuals. Allelic variants of DRB1 are linked with either none or one of the genes DRB3, DRB4, and DRB5. There are five related pseudogenes: DRB2, DRB6, DRB7, DRB8, and DRB9.

This presentation will show the investigation of the genetic polymorphisms of HLA-A, B, DRB1 alleles and haplotype frequencies in Hui of Ningxia Province from China. A PCR-based reverse line-strip sequence specific oligonucleotide hybridization method was used to determine the alleles of HLA-A, B, DRB1 in 122 unrelated, healthy Hui individuals of Ningxia Province. Allelic and haplotype frequencies of these loci were calculated by the maximum likelihood estimator method. Altogether, 14 HLA-A alleles, 28 HLA-B alleles and 13 HLA-DRB1 alleles were observed in the population. The most frequent HLA-A, B, and DRB1 alleles were HLA-A*02(29.9%), HLA-A*11(19.67%), HLA-A*24(17.62%); HLA-B*35(11.07%), HLA B*46(9.84%), HLA- B*13 (8.20%); HLA-DRB1*15(13.93%), HLA-DRB1*09 (13.11%), and HLA-DRB1*07 (10.66%) , respectively. The most frequent HLA A-B, B-DRB1, and A-B-DRB1 haplotypes were HLA-A*02-B*46 (9.42%), HLA-A*11-B*60 (4.07%), HLA-A*02-B*51 (3.83%); HLA-B*46-DRB1*09(6.03%), HLA B*13-DRB1*07 (4.01%), HLA- B*52-DRB1*15(2.87%); and HLA-A*02-B*46- DRB1*09(5.32%), HLA-A*02-B*58-DRB1*17 (2.46%), HLA-A*02-B*13- DRB1*12(2.38%), respectively. These results indicated that the HLA loci are highly polymorphic in Hui of Ningxia. Hundreds of HLA-A, HLA-B, HLA- DRB1 alleles have been described and typing for these polymorphisms is routinely done for bone marrow, kidney transplantation, and forensic identification.

Human Leukocyte Antigen, HUI, Genetic Polymorphisms

284 Application and Evaluation of Sinofiler Kit in Forensic Testing

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The aim of this study was to utilize and evaluate the Sinofiler kit (Applied Biosystem USA) for paternity testing and individual identification of the Chinese Han population. Methods: By using the multiplex fluorescent amplification system, capillary electrophoresis, and GeneMapper typing, 15 STR loci were genotyped in 200 unrelated Chinese Han individuals, 106 cases of paternity testing, and 20 individual identification cases.

Results: The 15 STR loci included in the Sinofiler kit were in accordance with Hardy-Weinberg equilibrium. The family survey confirmed the Mendelian inheritance of rules. The observed heterozygosities (H) were between 0.7247 and 0.8597; the discriminating power (DP) was between 0.8772 and 0.9656; the power of exclusion (PE) was between 0.4816 and 0.7211; and the PIC was between 0.6764 and 0.8520. The CPE and CDP of Sinofiler kit were between 0.999999763 and 0.9999999999999999478. The sensitivity of Sinofiler kit was 62.5pg DNA in the 12.5 μ L reaction system. Compared with the Identifiler kit (Applied Biosystem USA), Sinofiler kit had two new loci, D12S391 and D6S1043 instead of THO1 and TPOX. The two loci, D12S391 and D6S1043, had higher polymorphic values than that of THO1 and TPOX loci in the Chinese Han population. Conclusion: The results showed that the 15 STR loci included in Sinofiler kit were highly polymorphic and it is suitable for Chinese Han paternity testing. In inclusive cases, Sinofiler had a higher average for PI values than that of the Identifiler. In exclusive cases, Sinofiler is more effective than Identifiler. Sinofiler kit was also suitable for making the individual identifications used in testing samples involving small amounts and degraded DNA from blood stains, hair roots, semen stains mixed with vaginal secretions, cigarette butts, muscle tissue, bone, etc.

Sinofiler, Identifiler, STR

353 Study of Diptera Succession on Pig Carrion in an Urban Area in Malaysia

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A study of diptera succession patterns within an urban area were conducted at the University of Malaya, Kuala Lumpur, Malaysia from June to August 2007. The purpose of this study is to analyze the sequence and composition of diptera within urban areas. Two pig (*Sus scrofa*) carrions were used in this experiment to simulate human remains. One was placed directly on the ground fully exposed. The other was placed inside an abandoned house 50 meter away. Both carrions experienced five stages of decomposition; fresh, bloated, decay, post-decay, and dry remains. The carrion placed outdoors decayed faster than the carcass placed indoors. The indoor carcass bloated faster and remained bloated for about four days. The successions follow this sequence: Calliphoridae, Muscidae, and Stratiomyidae. Sarcophagids were also presents but their attendance was unpredictable.

Blowflies, Decomposition, Forensic Entomology

672 Two Forensic Entomology Case Studies Where Temperature Thresholds Were Used to Identify Precise and Specific Times of Insect Activity on the Victims

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The primary application for using entomological evidence recovered from a death scene is to estimate a likely range of the postmortem interval (PMI) or time since death. While it is recognized there are other uses for this evidence, placing a reasonable time when the victim died is by far, the most utilized. This is most often accomplished by tracking the known development of a carrion insect: identifying the species, determining the oldest life stage, and then consulting climatological data to determine energy units available for the species growth requirements. Less used is the succession model approach. Two case studies from the Midwest United States illustrate additional techniques available for assessing the time since death. In the first case a college student attending a major university in Indiana went missing on the late evening or early morning hours of January 12/13, 2007. Police and university employees conducted an intensive campus wide search of all university facilities. In addition, thousands of man-hours of police time were devoted to running down leads regarding his disappearance. On March 19, 2007, while doing routine maintenance in an electrical transformer room, the remains were discovered. This area had originally been "searched" on January 14, 2007. The young man had crawled among the transformers and had been electrocuted. Entomological evidence was collected and provided two distinct sets of specimens, one set was eggs and 1st instar larvae (*Calliphora vicina*), the other set was three 3rd instar larvae (*Calliphora coloradensis*). The temperature threshold for flight and oviposition of the *Calliphora* sp. is around 6°C. Temperature data for development of the small specimens were consistent with warming trends between March 10 and March 19. However, temperatures were below the lower limit activity threshold for the entire period of March 9, back to January 12/13 with the exception of only one day, January 13, where the daily maximum reached above 16°C. The brick transformer building modified the ambient temperatures due to the huge transformers creating heat (4°C increase). The lengthy duration and minimal growth temperatures was consistent with the colonization of the older larvae during the daylight after he had crawled into the transformer building (January 13) in the early morning hours of darkness. In the second case, the remains of a fully clothed female were discovered lying face down in an open field in southern Wisconsin on January 10, 2006. At autopsy, two adult insects were recovered tangled in the victim's hair. The woman was last known alive on November 21, 2005. The two specimens, Hymenoptera: *Formica* sp. (ant) and Coleoptera: Staphylinidae (beetle) are both ground dwellers, neither of these specimens are known to frequent carrion. There activity threshold is around 10°C, below which they will not be active. Upon daily temperature analysis from January 10, 2006 back to November 21, 2005 daily maximums did not reach near 10°C until November 28 and 27 respectively. In addition, temperatures between November 21 and 26 were well below the activity threshold temperature. The two insects could only have become entangled in her hair on either November 27 or 28, thus placing her body at the site on these two dates as a minimum PMI. However she could have been there longer. Her husband stated that she had died after drinking and doing drugs. He panicked and dumped her body on the evening of November 21, 2005. Autopsy injuries to her neck suggest an alternative cause of death. These two cases illustrate how rigorous study of the climatological data can pinpoint a time of insect activity, thus illuminating the PMI.

Time Since Death, Forensic Entomology, Blowfly

Forensic Nursing and Sexual Assault Examination

237 The Impact of Forensic Nursing and Its Effectiveness in Criminal Justice

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The issue of sexual assault and rape is a complex one. Greater still is the complexity of effective evidence collection and successful conviction of sexual offenders. One innovative tool useful to combating these growing issues of sexual assault and rape is the quickly emerging field of forensic nursing. Forensic nursing is the application of nursing science to evidence collection and investigations that lead to legal proceedings. Forensic nurses are most commonly utilized by the prosecuting branch of the criminal justice system in instances of sexual assault and rape. This project will attempt to measure the role, and impact, of forensic nursing among one of the most rapidly rising rates of crime in the American South.

As part of an ongoing project on the role of Forensic Nursing in the Criminal Justice System, the focus of this submission seeks to uncover:

- The role of Forensic Nursing in the central Alabama city of Birmingham
- The creation and history of forensic nursing in Birmingham (to include policy)
- The level to which practicing forensic nurses in Birmingham feel they have impacted evidence collection and successful conviction of sexual offenders

It is proposed that practicing forensic nurses in Birmingham feel they have had a large impact on efficient evidence collection and successful conviction of sexual offenders. In this project there will be two main elements of research. First, there will be a latent content analysis of the current policies regarding the use of forensic nurses in examining victims of both sexual assault and rape. This review will focus on the creation and implication of such policy and the rate of adherence to said policies.

The second aspect of this project, to what extent practicing forensic nurses feel they have impacted efficient evidence collection and successful conviction of sexual offenders, will consist of a collection of data obtained by survey. Through a series of ten questions, the survey will seek to measure what level of impact each forensic nurse feels they have made, the number of cases each forensic nurse is assigned to per calendar year, the rate at which the number of cases referred to each forensic nurse has changed since policy implementation and to what level practicing forensic nurses feel their body of work is relevant to the ongoing issues surrounding sexual assault and rape.

Forensic, Nursing, Research

274 Exploring the Role of Forensic Nursing: Implementation of a SANE Program in the Capital City

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Following on the coattails of a nationally recognized model for victim services provided by a volunteer physician rape crisis program in the traditional city of Baton Rouge...a small group of highly trained forensic nurses facilitate change in victim services by implementation of a state of the art sexual assault nurse examiner program at the charity hospital located in Baton Rouge Louisiana.

Join us in this poster presentation of the challenges and successes of this program that set a standard of care for victim services and changed the status quo of victim services in the state of Louisiana. Includes footage of the CNN Interview post-Katrina.

SANE, Forensic Nursing, Implementation

653 Preparing the Clinical Forensic Nurse for Criminal Trial Testimony

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One of the most daunting aspects of forensic nursing is that of courtroom testimony. When called upon, the nurse leaves the comfortable environment of the examination room to enter into the uncomfortable, if not frightening surroundings of the litigation world. Often time's difficult questions are asked and the nurse is expected to discuss the case truthfully, answering all inquiries to the best of one's ability. In some instances, the nurse is qualified as an expert and is expected to render an opinion about injuries and how they occurred.

The purpose of this presentation is to examine ways to prepare for criminal trial testimony. Several case examples will be used to illustrate how to effectively prepare for testimony, conduct research and educate attorneys. The participants will have the opportunity to explore cases, discuss how to prepare for testimony and render an expert opinion. In addition, the issue of nurses testifying on opposing sides will be explored. This will become more common as the forensic nursing specialty continues to grow. It is important that the nurse be able to anticipate potential strategies and educate the attorney on imperative information.

Clinical Forensic Nurse, Criminal Trial, Testimony

Forensic Nursing and Sexual Assault Examination

648 Sexual Abuse of the African Child and the Forensic Nurse Examiner

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A review of the First WHO International Conference on Sexual Abuse of the African Child held in Nairobi, Kenya, East Africa in September, 2007 will be addressed, which includes an introduction of the concept of the *Forensic Nurse Examiner*. As a progressive discipline, *Forensic Nursing Science* has provided new strategies in pediatric sexual assault examinations as one solution to the serious problems in sexual abuse in Africa.

Pediatric and adolescent sexual assault has historically presented a desperate need for qualified, experienced and compassionate child service providers. Yet, physicians worldwide are often reluctant to attend the sexually abused child or to specialize in this field. Improved forensic (legal) services to address this area of healthcare and the law were recognized through a combined effort of medicine, nursing, prosecution, and child advocates. They concluded that the Registered Nurse (RN) was the ideal clinician to provide sexual assault examinations to both adult and pediatric victims and was implemented as early as 1975 in the United States. This concept has revolutionized the medico-legal management of victims of sexual violence and is sanctioned by the American College of Emergency Physicians and the American Federal Bureau of Investigation.

Thus, the role of the Forensic Nurse Examiner (FNE) forms a partnership role with the Forensic Medical Examiner (FME) in the identification, examination, and intervention of the sexually abused child. It has been successfully replicated in numerous countries including South Africa. This role requires specialized knowledge in pediatric anatomy, normal vs. abnormal morphology of the hymen, identification of trauma, collection of biological evidence, correct positioning for observation of injury with photo-documentation of genital and non-genital trauma. Psychosocial intervention and transcultural sensitivity are essential in successful forensic examinations with minimum emotional stress and maximum evidence recovery. The RN who has acquired specified skills and expertise is also qualified to present expert witness testimony in this difficult and confusing area of prosecution. International experiences in the development FNE programs will be addressed.

Forensic Nurse Examiner, Pediatric Sexual Abuse, African Child

662 Assessment of Strangulation in the Clinical Setting to Trial Presentation

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It is documented that ten percent of violent deaths in the United States, each year are due to strangulation, six females to every male. Upon presentation to the Emergency Department the implementation of strangulation assessment protocols is vital for improved outcomes of patients with these complaints. The ABC's of trauma assessment and interventions can be expanded upon by using the specialty of Forensic Nursing. Careful consideration is exercised by the Forensic Nurse to never compromise care while completing the detailed assessment, thorough documentation and maintaining and preserving any evidence. If needed, this medical record provides concrete evidence of violence and can be imperative to the outcome of any legal case.

This presentation will demonstrate to members of the forensic science community, through a case presentation, the benefit of a comprehensive history and physical examination completed by a Forensic Nurse on a strangulation patient and then the crucial responsibility at trial.

Assessment, Strangulation

663 Recognition of Domestic Violence During Pregnancy

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Domestic or family violence is a significant public health problem in the United States and abroad. Knowing that 40-60% of domestic violence patients are abused when pregnant, routine screening should be conducted even if there are no apparent risk factors. Reasons given by clinicians for the reluctance to screen include lack of time, fear of offending patients, lack of training, and doubts about the efficacy of screening. The implementation of a Forensic Nursing Response can address these issues as well as work with other agencies. Ongoing abuse within a family carries serious consequences throughout the entire community. It affects the home, workplace, religious institutions, the criminal justice system, law enforcement, education and the health care system.

The goal of this presentation is to reinforce the importance of the clinician's assessment to identify and intervene for the mother at risk and her unborn child. Aggressive action taken in the healthcare setting is an integral part to the coordinated community response assuring the health and safety of these victims.

Recognition, Domestic Violence, Pregnancy

Forensic Nursing and Sexual Assault Examination

716 Victim Education Regarding Expectations of the “CSI Effect”

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The goal of this presentation is to discuss the phenomena of the “CSI effect” and the role of the Forensic Nurse Examiner in understanding and diffusing this effect.

Because of the popularity of the CSI television shows, the general public has come to expect instant results and they expect scientific evidence to solve each and every case. Given that many victims have “CSI level expectations”, it becomes absolutely paramount that the nurse who is aiding and/or obtaining the sexual assault evidence be educated in order to level set expectations.

Nurses are a tremendous source of comfort and support to victims during the sexual assault exam and evidence collection. As such the forensic nurse examiner has a unique opportunity to diffuse the “CSI effect” and considerable effort should be made to educate the victim regarding any misconceptions which may arise.

It becomes, therefore, an educational process for the nurse, who in turn is obligated to pass on this information to victims of crime. Through this presentation, information will be presented to give nurses a better understanding of what happens to the evidence once it leaves their hands and is taken to the crime laboratory. The process will be described in detail and the variety of DNA typing systems used will also be described.

Victim Education, CSI Effect, Touch DNA

713 Forensic Nursing Science: Sexual Assault and Death Investigation

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The Development of Forensic Nursing Science has had a major impact on the care and treatment of crime victims, offenders and those accused of criminal violence. Despite the number of such patients treated, many hospital emergency departments (ED) do not have a forensic nurse examiner (FNE) on staff to oversee proper attention to the legal implications of trauma care. The FNE maintains a professional partnership with the forensic physician known as a Forensic Medical Examiner (FME). The primary responsibility of the FNE is to identify trauma, accurately document findings, recover evidence, and testify in court. Healthcare personnel should no longer be allowed to refuse involvement in forensic case assessment and services. In some countries forensic patients are forced to await the arrival of the forensic medical examiner (FME), who is not in residence, to collect evidence prior to trauma care. If the FME is not readily available the patient is often transferred to another hospital (which may be in another town) to obtain forensic services prior to life saving intervention. It is not uncommon for the patient to die during transport and has been cited as ‘Death by Red Tape’. The presence of the Forensic Nurse Examiner on each shift eliminates an unnecessary delay, loss of life and/or evidence.

Nurses in all specialties, ED nurses in particular, must develop the necessary skills to competently care for patients classified as *clinical forensic patients*. Research has identified a minimum of 28 forensic patient classifications routinely admitted to the ED. These cases include domestic violence, child abuse, elder abuse, neglect, sexual assault, and rape among others. All accident cases must be evaluated to confirm or rule out intentional from non-intentional injury. Interpersonal violence comprises one of the largest case loads of forensic patients who often fail to identify themselves as crime victims out of humiliation or fear.

Due to the lack of forensic knowledge in traditional nursing education, forensic circumstances are frequently overlooked and evidence is lost or discarded in the absence of a FME resulting in a miscarriage of justice. Historically, forensic cases were considered the sole responsibility of the criminal justice system. Currently, forensic patients are considered a mutual responsibility between healthcare and the law. The FNE has emerged as a specialty practice to provide incisive attention to the legal, civil and human rights of victims and those accused of criminal acts. For too long innocent persons have been convicted and executed for crimes they did not commit.

In October 1998 the U.S. Emergency Nurses Association (ENA) issued a position statement that clearly outlines the responsibility of ED nurses in forensic cases that should not only provide physical and emotional care, but should focus on the identification, collection and documentation of forensic evidence. Care of victims of sexual violence is an area of expertise provided by the FNE who is highly skilled in the examination of sexual trauma – both the living and the dead. Prosecutors, police, homicide detectives, and forensic pathologists who work with FNEs concur that forensic nursing services are superior to those provided in the past and increases successful prosecutions. Increasingly, forensic pathologists are employing the FNE to provide medical evidence recovery at the scene of crime and provide the sexual assault examination prior to autopsy.

The presence of the FNE on duty at each shift responds immediately and provides the forensic services required by law. These services are within the scope of nursing practice. Because the forensic physician does not provide medical treatment, which is the role of the ED physician, the FNE can recover evidence, document and photograph trauma, ensure security of evidence during transfer to police, and later testify in court. Obtaining justice is considered an integral part of victim recovery. Forensic Nursing Science is expected to be a required course of study within the next 5 years. This presentation will address the evolution of Forensic Nursing Science and examples of its role in sexual assault and death investigation. Failure to provide social justice affects not only the victim but the community at large and reduces public confidence in the criminal justice system. Evidence lost or compromised may deny the victim social justice, for ‘justice delayed is justice denied.’

Forensic Nurse Examiner, Investigation, Rape, Death

Forensic Nursing and Sexual Assault Examination

717 Touch and Transfer DNA Samples: Evidence of the Future — Misconceptions, Potentials, and Real life Applications

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Touch and transfer DNA samples have become the newest and probably most mis-understood piece of DNA evidence. The purpose of the presentation is to gain an understanding of "touch and transfer" DNA samples and the impact they are having in the process of investigating violent crime.

Due to the continuing advancements of forensic DNA technology, there is potential evidence which may need to be collected by the forensic nurse examiner which previously may have been considered unimportant. This evidence is often referred to as "touch or transfer" DNA samples.

However, there is considerable amount of misconceptions as to what these types of samples actually entail. Whether these samples are valid evidentiary material and the potentiality of this evidence to be effectively typed by DNA analysis cannot be assumed to be the "end-all" to solve every case. While it is true that there is some utility in these types of samples, there are also pitfalls.

The pros and cons of these samples will be described, as well as techniques for the collection and preservation of the samples, the realistic expectations that can be placed on the value of these samples and how the collection of these samples should be documented.

Forensic Nursing, CSI Effect, Touch DNA

107 Data Mining - A Four Year Review of Sexual Assault Cases In New Zealand

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A database was recently introduced in New Zealand to record information from sexual assaults. The data was mined from sexual assault cases throughout the country where medical examination kits were referred to the Institute of Environmental Science and Research Ltd (ESR) by the New Zealand Police.

A total of 1200 cases from throughout the country from 2001 – 2005 were entered into the database. Each case was broken down into specific categories. General statistics such as the sex and age of the complainant, location and time of the assault, and the number of suspects were recorded. Also included were the results from the forensic examination of the swabs and slides from the medical examination kit along with relevant DNA findings. Toxicological data from the complainant including amount of alcohol consumed and time delay since analysis, plus many more factors were recorded and analysed. Demographic profiles of the sex, age, ethnicity and occupation of the complainants plus the location of the assault and the number of suspects have been compiled. Further statistical analysis of the data is still ongoing.

Sexual Assault, New Zealand, Database

363 Venereal Contamination in Minor's Sexual Attempts

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In this study we analyzed the incidence and the conditions of various types of assault (rape, rape attempt, sexual perversions) on 100 persons, victims of sexual offenses. Of these victims, 9% accused rape attempt.

Results: The victims were aged between 5 and 68 years with an underage (61%) and female (86%) majority. Out of the male victims, 82% were minors. The sexual aggression has been associated with physical violence lesions in 80% of victims, revealing the fact that most of the victims have opposed and fought the aggressor. This type of examination was carried out shortly after the incident, 1 to 7 days later. The nature of the violent lesions varied from light lesions, such as bruises (49%) to fractures and ruptures of perineum and of the internal abdominal organs (5%). In most cases, the lesions have been located especially on the face and limbs (74%). The forensic examination has included the checking for the presence of spermatozoa (in 54% of cases). In 41% of cases, the result was positive. In the cases of four of the victims contamination with treponema palladium was observed.

Conclusions: According to the study, the majority of the sexual aggression victims are minors regardless of gender. The sexual assault on minors was associated with serious perineal wounds and other physical lesions. In the cases which lacked sexual penetration, we observed minimal vulvar erosions or excoriations. The risk of venereal diseases was associated with the appearance of contamination.

Sexual Assault, Minors, Venereal Contamination

576 Positive Prostate-Specific Antigen (PSA) and Acid Phosphatase (AP) Reactions in Rectal Samples from Deceased Males

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Prostate-specific antigen (PSA) membrane test (Seratec®) is a sensitive screening method for detection of seminal liquid in rape cases. No study has been however performed on the reliability of this test when using rectal swabs from male decomposed cadavers.

The study material consists of 38 medico-legal autopsy cases, 20 males with advanced putrefaction changes and 18 with no visible signs of decomposition. In addition, rectal samples from 5 female decomposed cadavers and 5 recently deceased females served as controls. The swabs were dried, extracted in 1 ml distilled water and the test was performed according to the manufacturer's protocol (Seratec Diagnostica, Göttingen, Germany). We found positive PSA reactions in 14 rectal swabs (70%) taken from decomposed male cadavers, and in 11 swabs (61%) taken from recently deceased males. The anal swabs from the 10 female controls were all negative. We also tested the acid phosphatase (Phosphatesmo KM Paper®) reaction and found that 12 of the 14 PSA-positive swabs from the decomposed male cadavers showed a positive AP-reaction. All swabs taken from the female cadavers were negative. The positive rectal samples from male cadavers were tested using Y STR multiplex (Powerplex, Promega), but no foreign male DNA (semen) was observed in these cases.

Ther finding underlines the need to interpret cautiously the results of the PSA- and AP-tests from postmortal male rectal swabs.

Rectal Swabs, Prostate-Specific Antigen (PSA), Deceased Males

652 Age Determination From Fetus and Infant Teeth

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A forensic odontologist may determine the age of a forensic case from the dental structures. However, age estimation from tooth development is relatively accurate. This research is to determine the unknown age of fetuses and infants from tooth dimensions. A total of 400 teeth obtained from autopsies were measured. The bucco – lingual, mezio – distal, crown height, and crown thickness dimensions were taken and statistically analyzed by regression method. Results showed that; the most important factors are crown height and thickness measurements up to 52 weeks after conception. Later, root height is the most effective factor for dental age determination.

Age Determination, Teeth Dimensions, Fetus and Infant

646 Clinical Radiological 2nd and 3rd Molar Ossification vis-à-vis Epiphyseal Changes in the Elbow Region of Cosmopolitan Indians Compared With the Three Major Malaysian Races

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A study of children and young adults between the age ranges of 12 to 24 years of age from neighboring schools and medical students at the Maulana Azad Medical College (MAMC) was conducted from 1986 to 1988. The research compared the chronological data of second and third molars with radiological ossification data of appearance and epiphyses of the elbow region. These data were subsequently compared with X-rays of individuals 12 to 25 years of age from three major races in Malaysia were obtained from the Radiological Department of the University of Malaya, Kuala Lumpur, Malaysia. It was found that eruption of the 3rd molars among the Malaysians took place after crown completion when the root calcification was more than 1/3rd complete, similar to North and South Indian subjects of New Delhi. Among the Malaysians, there was some concordance between all the three races relating to the epiphyseal union at the lower end of humerus, including the formation of the epiphysis shared between the lateral three epiphyses among Malay, Indian, and Chinese races, with females ossifying earlier than males. Malaysian Indians and Chinese showed nearly a two year difference in the ages of ossification of the upper end of the radius (head) and ulna (olecranon epiphysis) – males vs. females. The Malay females showed differences between the fusion of epiphyses of the upper ends of their own radius and ulna, the radial head epiphysis fusing earlier. The females also showed differences in the fusion of the medial epicondyle separately to the shaft. The Malaysian Indians' medial epicondyle fusing a year earlier than their Chinese and Malay counterparts to the main shaft. The conjoint epiphysis, formed from fusion of the lateral epicondyle, trochlea, and capitulum was the first set of epiphyses to fuse in the elbow at 14 years of age, followed by the upper epiphyses of the radius and ulna with their individual racial variation. The medial epicondyle was the last epiphysis in the elbow region to fuse to the primary bone. In both Indians from New Delhi (both South and North Indians) and the three races of Malaysia, all the epiphyses were found to have fused in the elbow region by 16 years of age. However individual variation of sequence of fusion was noted which showed definite racial affinities.

Conclusion: The elbow is much more useful for correlation of age in the mid-teens, especially in the regions studied, relating to victims of alleged sexual assault and consent for "statutory rape" (16), age for minors for employment (14) etc. There is good correlation between the various racial differences in Malaysia, and broadly between the Indian and Malaysian subjects.

Clinical Age Estimation, 2nd/3rd Molars, Elbow Epiphyses

600 Dental Chart Identification of a Dismembered Female Body

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The Colombian Attorney General's Personal Identification and Missing Persons Team of CTI's Sectional Office for Cundinamarca and Amazonas was able to establish the identity of an unidentified female body using Forensic Odontology. The body was found in the town of Soacha, Cundinamarca on September 29, 2005. A trash bag containing the head and part of the upper limbs had been dumped near a bus stop. Finger tissues had been removed to avoid fingerprint identification. The victim's torso and part of the lower limbs were found later in a vacant piece of land located in the same area.

An oral autopsy was performed to enhance visibility of the dental structures and create a dental record by dissecting facial and neck tissue. Multiple facial injuries inflicted by the perpetrator were detected. Investigations pointed to the potential identity of the victim. An antemortem dental chart was obtained, and compared to the postmortem dental chart. Consequently, a POSITIVE identification was made.

Identification, Dental Chart, Homicide

545 Forensic Approach in Cases of Professional Odontological Responsibility in Colombia

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The claim of customers due to discontent over the results related odontological treatments have been increasing during the last years, specially in surgical areas, rehabilitation and orthodontia, but, in some other cases the general odontological activity must be explained by forensic odontologist when traumatic wounds occur within the professional circle.

This expo tries to establish orientation parameters and the essential basis of the Colombian forensic medical so that the judiciary, administrative and police authorities can investigate scientific, technological, and juridical arguments to take substantial decisions during investigation and trial.

Here is a case of professional responsibility claimed before the judiciary authorities related to pediatric odontology where the specialist applied the adaptation technique called "hand over mouth" and a few hours later the patient showed traumatic injuries over the lower lip membrane: The authorities required from the forensic odontologist of the Instituto Nacional de Medicina Legal y Ciencias Forenses (National Institute of Legal Medical and Forensic Sciences) explanation about the etiology of the injuries and the circumstances of time, ways and place to be able to typify the crime of personal injuries.

Injuries, Forensic Odontology, Pediatric Odontology

219 Identification of an Unidentified Skeletal Assemblage From a Mass Grave - 1755 Earthquake of Lisbon: Palaeodemography and Palaeopathology Identification by Dental Parameters - Part I

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In the morning of November 1 1755, All-Saints day, the earth shook. One of the more destructive earthquake and tsunami in the History of Europe struck Lisbon while people were in prayer, destroying many buildings.

In 2004, restoration work was carried on in the cloisters of the Lisbon Academy of Sciences that before 1834 was a part of the former Jesus Monastery. This allowed us to find isolated human bones in an unusual association with fish and other remains. There were no corpse burials. The cloister thus became a mass grave related to a catastrophic event, the great Lisbon 1755 Earthquake.

The aim of this communication is to present the results of an analysis of the so far recovered, more than a thousand disarticulated teeth (teeth still in articulation on skulls and mandibles are being studied, and the corresponding results will be presented later). A set of variables was analyzed in order to ascertain the origin of the material related to the 1755 Earthquake.

Dental analysis dealt with:

- the inventory of disarticulated dental skeletal material and dental identification;
- population affinities;
- dental Palaeopathology;
- age assessment;
- minimum number of individuals;
- causes and circumstances of death;
- postmortem modifications and taphonomy.

The sample from the cloister's southern wing comprises 1099 teeth disarticulated from the sockets. The disarticulated dental material was analyzed according to the guidelines' standards recommended by the British Association of Biological Anthropologists and Osteologists in conjunction with the IFA (Brickley & McKinley 2004). Recording of the material was carried on according to Buikstra & Ubelaker (1994). The material was analyzed macroscopically with a magnifying when needed. Digital photographs and stereoscopy have been used for illustration.

The variables under discussion based on the sample under study (1099 disarticulated teeth) allow us to draw the following conclusions:

- The population affinities are near entirely Caucasoid, along with very rare Negroids.
- Teeth correspond to population ages between the first childhood and young adults.

Forensic Odontology

- The minimum number of individuals recognized was 79 (the real number is certainly higher as assessed by other methods, as mandible and maxilla counting).
- Teeth are characterized by the high frequency of calculus, by degree 2 attrition, and by enamel hypoplasia.

On the sample under study, the observed lesions are compatible with fire exposure (media $\geq 300^{\circ}$ C) and with fracturing.

This first project is a part of a broader project, which is still being studied with crania and articulated teeth at jaws to help reconstructed events from 18th century earthquake that destroyed Lisbon.

Identification, Reconstructive way, Dental Parameters

38 Hurricane Katrina - Recovery and Identification of the Victims

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In August and September of 2005 Hurricanes Katrina and Rita dealt a severe blow to the central Gulf Coast of the United States. Louisiana and Mississippi were particularly hard hit. Over 11,000 persons were originally listed as missing from Louisiana. As a direct result of the storm and nearly 300 others later died in other states to which they were evacuated.

Within days of the storm striking the coastline, DMORT (Disaster Mortuary Operational Response Team) teams were on the ground in Mississippi and Louisiana to begin the process of recovering and identifying the victims. Eventually 231 bodies would be processed and identified at the Mississippi (East) Morgue in Gulfport and 875 bodies would be processed through the two locations – St. Gabriel and later Carville – that served as the West Morgue. In addition, the West Morgue would process 35 non-storm related deaths, primarily on behalf of the Orleans Parish Coroner whose facilities took on over 9 feet of water for nearly 30 days. The West Morgue also processed approximately 1,200 additional remains from coffins that were dislodged from their heretofore final resting place by the waters of Katrina and Rita. Additional remains from Louisiana were also processed through the Coroners Office of Jefferson Parish located in an un-flooded region of suburban New Orleans without the aid of DMORT.

Victims of the storm seen at the Louisiana DMORT facilities were nearly evenly divided by gender with slightly more than half (53%) of African-American heritage. Strikingly, more than two-thirds were 61 years of age or older with two thirds of those (nearly one-half (46%)) of the total deaths over the age of 75.

This presentation will detail the processes, procedures, equipment, and personnel used to accomplish the recovery and identification operations of DMORT in the aftermath of one of the most deadly nature disasters to befall America – 35 months ago, not far from where you sit today, this story begins.

Mass Disaster, Victim Identification, Odontology

32 Weighting of Highly Significant Dental Features in Forensic Identifications

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This presentation will highlight the importance of weighting highly significant dental features in forensic identifications. A case in which very few, but highly significant dental features were present, is presented.

Following an ammunition explosion at a military base, the author was requested to assist in the identification of the victims. The case was considered sensitive as it involved military personnel from two different third world countries. Antemortem records which were less than ideal had to be used in the identifications. The final identification of one individual was based on several highly significant concordant features, even though some obvious discrepancies were present. The discrepancies could be explained by comparing antemortem X-rays with the antemortem charting, which revealed a charting error. The weighting of the highly significant concordant features led to the positive identification of the victim.

The exact number of concordant dental features required for a positive dental identification has never been standardized. The frequency of dental features within specific population groups has also not been addressed. The evaluation of dental features as highly significant is subjective in nature, but scientifically acceptable.

Forensic Deontology, Identification, Weighting

104 Study on the Indexes of Forensic Identification by the Digital Orthopantomogram of the Normal Teeth

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Objective: The aim of this study was to explore more concise and unified forensic identification indexes for people with none dental disease in digital orthopantomogram.

Methods: To select randomly 170 digital orthopantomogram with none dental disease. Then, select indexes for full dentition patterns and dental alignment patterns according to the dental physiological variations and the characters of dental alignment respectively. Finally the diversity of all indexes would be evaluated by statistical analysis.

Results: The group with none dental disease had 74 kinds of full dentition pattern in 170 samples, thus the diversity was 43.53%. The group had 128 kinds of dental alignment pattern, thus its diversity was 75.88%. The group had 150 kinds of full dentition/dental alignment pattern, thus the diversity was 88.24%.

Conclusion: The diversity of the full dentition pattern was not very good. So it was not very effective when it was used solely. The diversity of dental alignment pattern was good. So the method could be used in the maxillofacial forensic identification. If the group was coded by the full dentition and dental alignment pattern at the same time, its diversity was better than any single pattern. So the method would be valuable in forensic identification.

Forensic Odontology, Orthopantomogram, Identification

302 Accuracy of Age Estimation from Orthopantomograph Using Demirjian's Method

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Objective: Developing teeth are used to assess maturity and estimate age in a number of disciplines. The aim of this study was to determine the accuracy of Demirjian's method (Panoramic radiographs were examined and seven mandibular teeth staged according to Demirjian's dental maturity scale) in the forensic clinical medicine.

Methods: Tooth formation was assessed from orthopantomographs of healthy children attending a dental teaching hospital Shanghai 9th people's hospital). The sample was 828 children (279 boys, 549 girls, aged 11–19 years) with similar number of children from Shanghai. The mean difference (\pm S.D. in years) between dental and real age was calculated and tested using t-test.

Results: The Demirjian's method overestimated age between 11 and 14 years of age and underestimated age between 15–19 years. Conclusion: Demirjian's method is useful for forensic age determination within the Shanghai children (aged 11–16 years), but its dental maturity scale must be updated.

Forensic Science, Age Determination, Demirjian's Method

269 A Series of Accidental Hanging Deaths in Children

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Hanging is an action in which a binding object constricts the neck under full or partial weight of the body, which in turn applies pressure to the respiratory tract, veins, and nerves, thereby preventing vital function and usually ending in death. Hanging cases are usually suicidal. Accidental and homicidal hanging cases are seen rarely.

In this study, 4,571 death examinations and autopsies performed at The Konya Branch of Forensic Medicine Council (Turkey) between 1998 and 2007. Of the cases investigated, it was found that 201 (6.5 %) involved hangings. There were a total of 13 accidental hanging cases of which 12 were children. The present study evaluated these 12 cases in terms of their demographic characteristics, the location of the incident, the manner in which the incidents took place, and the findings of the scene investigation and autopsy.

The ages of the cases ranged from 6 months to 11 years, with an average age of 3.4 years. Ten of the cases were boys and two were girls. In seven cases, death occurred involving a scarf around the swing cradle intended to prevent the baby from falling. While the baby was leaning out of the cradle, the scarf wrapped up around his/her neck, resulting in asphyxiation. Three cases involved hanging by a rope in the yard of the home, one case involved a rope hanging down a construction wall, and the last case occurred when the child's neck was entangled in a tight cable of the electric heater while he was crawling on the floor. As a result of the investigations and autopsies, it was determined in all of the cases that deaths had occurred as a result of hanging.

In conclusion, accidental hangings often occur in childhood. The researchers conclude that using bedsteads that are fabricated, particularly for children, instead of swing-like cradles, removing ropes in and around the house in which children might get entangled, and preventing children from reaching rope-like objects and playing with them will reduce accidental hanging deaths.

Hanging, Childhood, Death

106 An Autopsy-Based Retrospective Study of Injury Patterns of Homicide in Hong Kong: Injuries Pattern, Severity, and Prediction of Motive and Relationship With the Offender

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Homicides, especially those involving domestic violence, have raised great public concern over the last few years. There are to date only a few comprehensive studies regarding homicides in Hong Kong. This study is based on the descriptive information collected from official reports. Its focus is on investigating injuries and the injury patterns found on deceased victims caused by sharp instruments and their possible predictive value in identifying characteristics of the victim-offender relationship.

The numbers of injuries were counted and the severity of each wound scored, and inputted into a victims' injury database according to body regions. The demographics of the deceased, internal injuries, defensive wound, alcohol level, drug level, and cause of death were also collected. One Hundred Seven fatal victims of sharp weapons with known suspects were identified between 1996 and 2005 in Hong Kong. Seven cases were excluded due to missing data. The acquaintances category formed the largest proportion among relationship between victims and offenders (40%), followed by close family members (29%), strangers (21%), and lovers (10%).

Multiple-nominal logistic regression test (SPSS 15.0) were performed and suggested that head cut ($p=0.015$), face laceration ($p=0.023$), neck cut ($p=0.114$), back bruise ($p=0.060$), and defensive wound ($p=0.099$) are correlated with the relationship between offenders and victims (VOR) in homicide cases. A predictive model was then built using these parameters to predict VOR at four levels: close family members, lovers, acquaintances, and strangers. The preliminary model suggests a moderate amount of explanatory power to predict the VOR (Cox and Snell $R^2=0.38$). The overall prediction is around 50%, which correctly identified 45% close family members, 42.5% acquaintance, 30% lovers, and 81% strangers.

The study suggested a model to predict the relationship between the offender and the victim (VOR) based on the autopsy reports and the findings from the crime scene, and proposed that injuries in head and face alone might not be good indicators to predict the VOR. In combination with other parameters, the prediction accuracy can be improved.

This mathematical model is tailor-made for Hong Kong and is the first study in Chinese society. It is hoped that in the latter part of this study, experts can profile offender specifically by predicting the gender, age range, and motive of the killing, and test its use as a tool to direct homicide investigation.

Injuries Pattern, Victim-Offender Relationship, Homicide

430 An Unusual Case of Multiple Gunshot Suicide

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Presented is a case of a 54-year-old male who suffered from liver cancer and committed suicide under the influence of alcohol. The decedent discharged his revolver three times: a) to the head (no brain damage, re-entrance at the left wrist), b) to the left semi-thorax (no damage of the inner organs) and c) to the right semi-thorax, causing perforating wounds to the right lung, the pericardium and the heart. He died on the way from the local medical center to the nearest town General Hospital approximately 1.5 – 2 hours after shooting himself. He was able to talk and communicate from the time the incident took place until just before he died.

Shooting and poisoning are the most common suicide methods among cancer patients. On the other hand, alcohol intoxication is not often found in suicides committed by cancer sufferers. Furthermore, in the authors' best knowledge, there is no literature about alcohol intoxicated cancer patients who committed suicide by shooting themselves more than once and were "physically active" after a penetrating gunshot wound to the heart for such a period of time.

Multiple Gunshot Suicide, Alcohol Intoxication, Incapacitation - Physical Activity

72 Analysis of 32 Deaths During Aesthetic Procedures

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In Santiago de cali, Colombia during 1998 to 2006, 32 necropsies associated with aesthetic procedures were performed. Of these, 26 were during the surgical procedure and six were complications due the application of substances, mainly liquid silicon (BIOGELTM)

Two of the 26 deaths during the surgical procedure were performed by non-medical personnel, two by general practitioners, and one by a dermatologist. The other cases were performed by plastic surgeons (21 cases).

The six cases associated with application of liquid substances were performed by general practitioners (1), technical in aesthetic procedures (4), and one case by the patient.

The most common cause of death on the study was vascular trauma (8 cases), and sepsis, fat embolism and thromboembolism on second place, each one with three cases.

In two cases death was associated to cardiopathies, two cases of encephalopathy and one case of peritonitis, another causes were alveolar diffuse damage, disseminated intravascular coagulation and finally two indeterminate deaths.

Of the six cases of death associated to the use of injectable substances, three cases were due to microemboli of material (mainly silicon), one case for necrotizing fasciitis and two more for sepsis.

Surgery Death, Aesthetic Procedures, Cali, Colombia

337 Analysis of Postmortem Metabolic Changes Using ATR-Fourier Transform Infrared Spectroscopy

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Estimation of the time since death (postmortem interval, PMI) is one of the most difficult problems in forensic investigations and currently, many methods are developed to estimate the PMI. Fourier transform infrared (FT-IR) spectroscopy has increasingly become a powerful, nondestructive, rapid analytical tool in biochemistry and biomedicine due to its high sensitivity in detecting the changes in the functional chemical groups of tissue components, such as proteins, lipids, nucleic acids, and carbohydrates. Additionally, FT-IR technique does not require special sample preparation or any biochemical reagents compared with other bio-molecular methods. Therefore, it hasn't any influence on the chemical changes within the tissue postmortem.

This study was to investigate the postmortem changes of FT-IR original spectra of rat tissues including heart, muscle, lung, kidney, spleen, and liver at different ambient temperatures (4°, 20° and 30°). For each temperature, tissue samples at time zero, 12 h, 24 h, 48 h, 72 h, 96 h, 120 h, 144 h, and 168 h were taken for testing. The tissue samples were directly placed on the attenuated total reflectance (ATR) accessory for FT-IR analysis. The bands at 3303 cm⁻¹, 3015 cm⁻¹, 2958 cm⁻¹, 2927 cm⁻¹, 2876 cm⁻¹, 2857 cm⁻¹, 1338 cm⁻¹, 1647 cm⁻¹, 1537 cm⁻¹, 1456 cm⁻¹, 1396 cm⁻¹, 1303 cm⁻¹, 1338 cm⁻¹, 1023 cm⁻¹, and 1080 cm⁻¹ were chosen for analysis. The frequency and absorbance of each assigned band (A_x represents FT-IR absorbance at wave-number x cm⁻¹) were used to evaluate postmortem metabolic changes.

For samples from different rat tissues at specific temperatures, the changes of band absorbance in FT-IR spectra were found to be highly correlated with increasing PMI in three ways: a) significant band absorbance increase was seen in the region whose spectrum are arising from the C-H stretching vibrations at 3015 cm^{-1} , 2958 cm^{-1} , 2927 cm^{-1} , 2876 cm^{-1} , 2857 cm^{-1} , 1338 cm^{-1} . The three additional bands at 1537 cm^{-1} , 1396 cm^{-1} , 1303 cm^{-1} showed increasing trend; b) significant band absorbance decrease was for characteristic bands of PO_2^- and N-H. c) the band absorbance of 3303 cm^{-1} , 1647 cm^{-1} , 1456 cm^{-1} remained relative constant. Furthermore, liver, spleen, and kidney showed larger changes than heart, muscle, and lung. Moreover, the changes of absorbance were dependent on ambient temperature. In addition, the changes of band absorbance were largest at 30° and least at 4°. However, it turned out there were no significant shift for these band frequencies after death. This method was further applied to human postmortem tissues based upon the established trend seen in the rat results. The spectra from human showed similar trends observed from rat postmortem changes.

In conclusion, there were three different types of metabolic changes after death based on the spectral results: a) increasing continuously (e.g. C-H stretching region), b) decreasing continuously (e.g. PO_2^- symmetric stretching), and c) remaining relatively stable (e.g. C-OH bending, CO-O-C asymmetric stretching). The band absorbance showed strong linear correlations against PMI. Therefore, in addition to other classical methods, FT-IR spectroscopy may be a great tool for estimating PMI at the molecular level in forensic investigations.

Postmortem Interval, Fourier Transform Infrared Spectroscopy, Absorbance

119 Autopsy in Iran, a Legend or a Necessity? Current Problems of Doing Autopsy in a Moslem Country, Iran

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Autopsy, the scientific postmortem procedure for evaluation of internal viscera by incising and opening the body to discover the main and/or contributing cause of death is still believed to be the gold standard for quality control of all medical managements, diagnostic procedures, etc. as well as a powerful scientific tool for forensic evaluation of any suspicious or violent death.

History of autopsy is as long as the history of medicine, however classic, modern, and scientific autopsy only ages about few decades with the contributing role of pathology and microscopic fields. Rudolf Virchow, William Osler, and many other famous scientists have had valuable roles in introducing the autopsy as an origin of modern medicine by diagnosing and documenting a large number of disease entities as well as causative agents or organisms. In routine daily practice of all forensic pathologists in Moslem countries, excess resistance is noted by the relatives of the deceased especially in purely medical cases. The incorrect cultural and religious belief of tearing of a body after death makes them anxious and sometimes even very angry and aggressive about the autopsy.

In this prospective study, annual autopsy rates in the legal medicine center of Fars Province over a 10 year period (1995-2005) is calculated by the formula: $\frac{\text{Total number of autopsies performed in Fars Province legal medicine center}}{\text{year}} \times 100 \frac{\text{Total number of deaths in Fars province}}{\text{year}}$

At this period hundreds of questionnaires were also distributed through 3 different population samples listed below:

1. Medical staff including specialists, physicians, nurses, and medical students.
2. First degree relatives of the dead individuals.
3. Random sample of normal population in different educational and intellectual grades.
4. The questionnaires evaluated the individual insights of "**Autopsy**", associated problems, and opinions on how to increase the rate of autopsy.

Results:

1. Mean autopsy rate during a 10 year period throughout the province is **5.09%**
2. Using statistical and analytical criteria, two major contributing factors of low autopsy rate (compared with American and European's) were:
 - a. Lack of morality and appropriate insight of the medical staff about the necessity and diagnostic importance of autopsy.
 - b. Incorrect religious and cultural beliefs in Moslem people about the autopsy as well as the sense of fear and lack of respect of the body in autopsy.

Conclusions: What are experts expected to do? Could the autopsy be forgotten? An autopsy rate of more than 58% was reported in one of the general hospitals associated with Texas University of Medical Sciences in the United States. Iran reports a much lower autopsy rate and consequently less postmortem diagnoses and also suboptimal evaluation and quality control of pre-mortem approaches and managements.

In the presenter's personal experience, performing thousands of medicolegal autopsies, the medical staff should be enlightened about autopsy and at the same time fight the resisting beliefs about autopsy by educating people, taking into consideration the religious orders and updates regarding this valuable non-replacing diagnostic procedure.

Autopsy, Iran, Autopsy Problems

609 Characterization of the Cases of Cyanide Poisoning - Bogota Colombia 1997-2007

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Cyanide poisoning, is a frequent cause of death in Colombia. The use of cyanide in the processing of jewelry, selling without control, and lethality of the substance make this kind of poisoning one of the most frequent suicide methods chosen. While it is true that most of the cases reported in this area are related to suicide, there are some cases associated with murder.

This review characterizes the cases in which the cause of death was cyanide poisoning. Additionally, it provides the tools necessary for Institutions of Colombian sanitary control to initiate processes to control the unrestricted sale of this substance.

Cyanide, Poisoning, Suicide

601 Comparison of Atherosclerosis Ratio of Three Main Arteries at Autopsies in Trabzon

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It is universally accepted that studies based on the evaluation of atherosclerotic lesions in arteries evaluated in autopsy studies yield valuable information about the natural history of human atherosclerosis. Evaluation of plaque in the big arteries appears to provide the best prediction of cardiovascular prognosis at autopsies.

In this study, the degree of atherosclerosis was examined macroscopically in the luminal surface in the formalin-fixed aortas, common carotid, and subclavian arteries of 100 random autopsies performed at the Morgue of Forensic Medicine Council, Trabzon in Turkey. Both the extent of surface involvement and the character of the lesions are observed. Intimal lesions are classified as grade 1, fatty streaks; grade 2; fibrous and atheromatous plaque; grade 3; necrotic, hemorrhagic, or thrombotic plaque; and grade 4; calcified plaque. Also, according to modification of Gore- Tejada's atherosclerotic index, the atherosclerosis in the large arteries was semi-quantitatively scored on a scale of 0-8 according to the ratio of the atheroma- occupied area to the entire surface area.

In the present study, subsequent aging is associated with a progressive increase of aortic atherosclerosis. A postmortem comparative analysis of atherosclerosis among three main arteries also has been carried out. The severity of atherosclerosis differed greatly among arteries.

The clinical assessment of atherosclerosis is a challenging subject and the pathological study by autopsy is still the most reliable assessment method of systemic atherosclerosis.

The results support the contention that control of the progression of atherosclerosis through risk factors modification should begin in early years.

Atherosclerosis, Arteries, Plaque

151 Establishment of the Model of TSAH and a Study on Relationship Between TSAH and Blood Alcohol Concentration in Rats

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The forensic investigator is frequently confronted with subarachnoid hemorrhage (SAH) that is caused by relatively slight trauma to the head or neck of a person drinking. This type of trauma accounts for 87% of traumatic subarachnoid hemorrhage (TSAH) and is considered by experts to be frequently occurring type. Because of the messiness of its mechanism and other related factors, especially the degree of alcohol consumed by the victim in TSAH, conclusive identification of such cases is often disputed. It has been reported that alcohol consumption is also closely related to spontaneous subarachnoid hemorrhage. To date, however, there is no concrete report about TSAH after alcohol consumption based on animal testing. The authors conducted an animal study and will present the results which demonstrate the effect of alcohol on the occurrence of TSAH.

One hundred twelve male Sprague-Dawley (SD) rats (body weight 250-350g) were randomly divided into three groups: the sole-hitting group, the sole-alcoholism group, and the alcoholism-and-hitting group. A self-made iron pendulum was used to hit the parietal bone and occiput to idiopathic cataphora at different times after intragastric administration of edible wine. Whole brain, arterial blood of rats were sampled for morphological and blood alcohol concentration (BAC) examination.

The incidence rate of TSAH was 1.61% in sole-hitting group, 54.76% in the hitting- and-alcoholism group and the incidence rate of spontaneous subarachnoid hemorrhage (SAH) in sole-alcoholism group was 12.50%. the incidence rate in alcoholism-and-hitting group is significantly higher ($P < 0.01$) than the sole-hitting group, and higher ($P < 0.05$) than the sole-alcoholism group, but there was no significant differences ($P > 0.05$) between the sole-hitting group and the sole-alcoholism group. The positive correlation between the incidence rate of TSAH and the blood alcohol concentration (BAC) was $r = 0.994$, $Y = 0.5717X + 6.2077$, $P < 0.01$. The incidences rate of TSAH in different

area of brain in alcoholism-and-hitting group were: 91.30% in brain-stem, 78.26% in cerebrum, and 30.43% in cerebellum. Both of the incidence rates of TSAH in the cerebrum and brain stem are significant higher than the cerebellum, which were $\chi^2=10.602$ $P<0.01$ and $\chi^2=17.889$ $P<0.01$. However, there is no significant difference ($\chi^2=1.516$ $P>0.05$) between the cerebrum and the brain stem.

Both of the external injury and alcoholism can cause SAH, but their synergism effect were far more obvious. Alcoholism is one of the main promoting agent of TSAH.

This work was supported by the National Natural Science Foundation Council of China (No. 30772458).

Traumatic Subarachnoid Hemorrhage, Model of Alcoholism, Relation of Dose-Effect

103 Fracture of the Cricoid as a Potential Pointer to Homicide: A Six Year Retrospective Study of Neck Structures Fractures in Hanging Victims

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Confronted with an apparent suicidal hanging, the forensic pathologist must keep in mind the possibility of a simulated hanging. However, this distinction is highly challenging.

In the present study, neck structure fractures in all cases of suicidal hanging over a six year period were retrospectively reviewed. The purpose of the study was to assess if the presence of a cricoid fracture could be a possible pointer to homicide, by excluding a typical suicidal hanging.

Over a six year period (2000-2005), autopsy cases of suicide by hanging performed at the *Laboratoire de Sciences Judiciaires et de Médecine Légale* of Montreal were retrospectively reviewed for the presence of fractures of neck structures. During that period, a total of 239 cases of suicide by hanging were found. Of these, eight victims were excluded from the analysis either because of a skeletal or charred body, or because only an external examination was done. Overall, 231 cases of suicidal asphyxia by hanging were analyzed for the presence of fractures of the hyoid bone, thyroid, and cricoid cartilages.

Overall, fractures of neck structures were found in 23.4% of cases (54 cases), while 76.6% of suicidal cases did not present any fracture (177 cases). Isolated fractures of the hyoid bone were observed in 2.6% of cases (6 cases), isolated fractures of the thyroid cartilage in 43 cases (18.6%), whereas combined fracture of the hyoid bone and thyroid cartilage were present in five cases (2.2%). As for the cricoid cartilage, it was intact in all suicidal hangings.

Thyroid cartilage was the most commonly fractured neck structure. As a matter of fact, isolated or combined thyroid cartilage fractures accounted for 88.9% of fracture cases (48 cases). In comparison, only 20.4% of cases with fractures presented isolated or combined hyoid bone fracture (11 cases).

Victims presenting fractures of neck structures were significantly older than victims without fracture ($p<0.05$), with an average age of 40.8 (± 11.8) and 32.6 (± 13.1) respectively. In fact, for the 95 victims aged 30 years or less, 90.5% (86 cases) had no fracture, whereas 9.5% (9 cases) did. On the other hand, for the 134 victims of more than 30 years of age, 33.6% (45 cases) presented a fracture. A cross table statistical analysis confirmed that younger victims are more prone to present no fracture than to do so ($p<0.05$). As for the older victims, though the majority still do not present a fracture (66.4%), they are more prone to present a fracture than younger victims ($p<0.05$).

In terms of gender, male victims presented a significantly higher incidence of fracture than female victims ($p<0.05$). Indeed, 25.8% of males (50 cases) presented fractures of neck structures, while the incidence in females was 10.8% (4 cases). The average age of victims with fractures was similar for both men and women (40.6 \pm 12.1 for men and 43.3 \pm 8.4 for women).

Results will be further compared to neck structure fractures in 52 homicidal non-hanging type strangulation victims and four homicidal hanging victims. Neck structures fractures in general and cricoid fracture in particular are more frequently encountered in homicidal non-hanging type strangulation victims and homicidal hanging victims.

The role of cricoid fracture as a potential pointer to homicide will be discussed.

Hanging, Fracture, Cricoid Cartilage

666 Mechanisms of Delayed Splenic Rupture: A New Hypothesis

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After attending this presentation, attendees will understand a new hypothesis which describes a potential mechanism of delayed splenic rupture. The authors hypothesize that the pressure produced by a full stomach following a heavy meal may dislodge a paraplegic hematoma on the gastric surface of the spleen, which formed at initial bleeding from a splenic laceration.

This presentation will impact the forensic community by introducing a new mechanism of delayed splenic rupture. In addition, it impacts the medical and surgical communities by reducing the high mortality rate in delayed splenic rupture.

A 46-year-old man was assaulted with a club to the face and chest and sustained multiple contusions. On admission there were no signs of circulatory shock. The abdominal examination was unremarkable. During his stay in the hospital he had light meals due to pain and loss of appetite. He was symptomatically managed and discharged five days after the incident.

Two hours after discharge he was admitted again with complaining of severe abdominal pain. He claimed that soon after his return to home, he ate two full plates of rice and curry, three mangoes, and drank two glasses of water. Immediately after the meal he began experiencing abdominal pain.

On admission, he was pale with a pulse rate of 116 beats per minute and a blood pressure of 60/30 mmHg. There was a marked tenderness with rigidity and guarding on abdominal palpation. Bowel sounds were attenuated. Hemoglobin level had dropped to 7.2 g/dl from a level of 10.5 g/dl within five hours. Two pints of blood were transfused. Although an ultrasound scan of the abdomen was planned, the patient was pronounced dead 13 hours after admission.

Autopsy revealed a generalized pallor. The abdomen was distended. A contusion of 8x3.5 cm was seen on left lower chest laterally. There were no rib fractures. A hemoperitoneum of 2300 ml was noted. The spleen was within the normal range. A hematoma of 2.5x3x1.5 cm was seen overlying a splenic laceration on the gastric area of the visceral surface. The laceration was 1.25 cm in length with a depth of 0.25 cm, involving splenic capsule and parenchyma. The body of the empty stomach was in contact with this hematoma. Histological examination confirmed the perisplenic hematoma of otherwise normal spleen.

The mechanism of this serious and possible life threatening complication is still not fully understood. There are a number of potential mechanisms for delayed splenic rupture.

Intrasplenic hematomas, pseudoaneurysms of intraparenchymal splenic artery branches, and asymptomatic splenic pseudocysts all of which develop following abdominal trauma and rupture, possibly days, months or years later are three mechanisms suggested in this context. Also bleeding from a splenic rupture could be tamponaded by surrounding organs and /or perisplenic hematoma formed at the time of injury, delaying its rupture at a later date.

The visceral surface of the spleen consists of gastric, colic and renal surfaces. The gastric surface is directly in contact with the body of the stomach. Therefore a perisplenic hematoma which plugs the splenic laceration on the gastric surface temporarily, may easily be dislodged by the mechanical forces exerted by distending stomach, causing fatal intraperitoneal hemorrhage. Such risk is imminent during the early period of regeneration of splenic laceration where wound breaking strength is relatively low.

In this case, the laceration occurred at the time of assault was plugged temporarily by the hematoma. On the fifth day, pressure exerted by the full stomach after the heavy solid meal, dislodged the hematoma causing hemorrhage from the site of laceration.

The pressure exerted by a full stomach after heavy solid meals may disturb perisplenic hematoma overlying a laceration on the gastric surface of the spleen causing delayed splenic rupture leading to sudden fatal intraperitoneal hemorrhage.

It is advisable to maintain a light liquid/semisolid diet instead of a heavy solid meal during the period of recovery of patients who experience perisplenic hematomas due to lacerations on the gastric surface of the.

Delayed Rupture, Spleen, Mechanisms

28 Postmortem Alterations in the Muscle: Time and Temperature Dependence of Selective Protein Markers

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The objective of this presentation is to understand better the specific alterations occurring in the postmortem muscle tissue. The first stage of decomposition occurs when the muscles undergo a transformation causing them to stiffen and remain in a constant contractile state, known as rigor mortis. In many cases of homicide, the estimate of the time of death may actually depend on the fact if the body had been subjected to subzero temperatures. One important way of determining this is by measuring the damage to the skeletal muscle which correlates with the time as well as the storage temperature.

These results could be very useful to the forensic science community to help professionals estimate the time of death / postmortem interval, and if the body was subjected to sub zero temperatures, for how long before being thawed and found.

Postmortem alteration of the muscle tissue greatly varies depending on the time as well as the storage temperature. Most of these changes are due to the denaturation of the muscle proteins especially the myofibrillar proteins. The degradation process is also affected by the proportion of the red and the white muscle fibers.

The present study has been undertaken to understand the postmortem alteration in the muscle tissue with a fish species as a forensic model. The reason for choosing the fish as a model is because the two principal muscle types (red and white) are localized as separate layers which is useful in observing the specific changes in these muscle types.

A characteristic pattern of histological and histochemical alterations are observed in the muscle fiber types. The myofibrillar protein fractions show variability in their degradative process due to the protease activity. The importance of the specific biomarkers (like myosin light chains, actinin) as well as the protease inhibitors are emphasized.

Postmortem, Muscle, Temperature

109 Risk of Hand-Grenade Explosion and Public Health in Transkei Region of South Africa - Case Reports

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During the apartheid era in South Africa explosive blasts were common. Transkei was the lynchpin of the government's homeland policy, and a major center for the struggle against apartheid. Weapons and ammunition were stolen from the South African factories and army warehouses and stored in safe places. Still these unused explosives are threat to public health.

This is a report of a group of children who were looking after cattle in a field and found a M26 hand grenade. They were playing with it and accidentally detonated. Six of the eight children died instantly while the other two sustained minor injuries. The M26 grenade has been designed to harm through high velocity fragments that it expels. The result is great mutilation of the body particularly to those who are closer to the blast. In this report the nature and severity of injuries are described. The mechanisms of injury and possible criteria used to predict injuries caused explosions are discussed and preventive measures are suggested.

Hand-Grenade, Explosion, Public Health

678 Simultaneous Sudden Infant Death in Twins From Brugada Syndrome - Critical Forensic Issues in Death Investigation and the Role of DNA Testing

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Presented here is the first reported case of Simultaneous Sudden Infant Death Syndrome (SSIDS). The mother of a pair of identical, male, monozygotic twins, 138-days-old with no significant medical history found them prone, cyanotic, and breathless in their crib. She was unable to resuscitate them. A thorough scene investigation and complete autopsies including toxicological, microbiological, radiological, and metabolic studies were unremarkable as was vitreous chemistry. Molecular analysis showed a heterozygous nonsense SCN5A mutation (W822X). Using confocal microscopy researchers were able to demonstrate that the abnormal, non-functioning, sodium channels were localized on the intercalated disk. Compared to controls, heterozygote expression in the twins hearts showed a nearly 50% reduction in Na⁺ channels expression in ventricular myocytes. Alterations in sodium channel expression and function can have major effects on cardiomyocyte excitability that may lead to long QT syndrome type III and Brugada syndrome, with a potentially fatal outcome. As recently as five years ago, investigators would have strongly considered the possibility of infanticide. Had the mother been charged, she would have had no way of proving her innocence. This case, and other similar recent cases – such as the nursing mother whose breast fed child died of morphine intoxication because she had a 2 x 2 duplication of the CYP2D6*2A allele – illustrate the crisis now facing forensic pathology and toxicology. When can an autopsy be considered truly negative? More importantly, when can experts testify that they have determined the cause of death "beyond any reasonable doubt?"

Brugada, Twins, DNA Testing

102 Six Year Retrospective Study of Suicidal Hangings: Determination of the Pattern of Limb Lesions Induced by Body Responses to Asphyxia by Hanging

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From time to time, the body of a hanging victim is found to present bruises or lacerations. More often than not, this raises the suspicion of foul play or homicide. However, in a recent study analyzing video recordings of hanging, it was demonstrated that asphyxia by hanging is associated with a complex pattern of body movement responses, with not only convulsions but also alternating phases of decerebration and decortication rigidity. Therefore, it seems possible that hanging victims may hurt themselves during this sequence of body movements, especially if the hanging occurred in a restraint area like a wardrobe or a staircase.

The objectives of the present study was first to estimate the proportion of hanging victims with limb bruises or lacerations, and then to compare this rate between hanging in restraint spaces versus hanging in more open settings. Furthermore, a description of the usual pattern of limb lesions will be drawn to help the forensic pathologist to assess, in a particular case, if the pattern of lesions is compatible or not with lesions secondary to the process of hanging.

Over a six year period (2000-2005), in Quebec province (Canada), all cases of suicidal hanging (239 cases) were retrospectively reviewed for the presence of limb lesions. Of these, victims presenting a combination of hanging and other injury modalities (complex suicides, 6 cases) were excluded from the analysis since hanging was not the sole cause of death. Moreover, all cases with significant postmortem changes (advanced decomposition, skeletal, and charred bodies) were eliminated from the analysis (26 cases). Overall, a total of 207 cases were considered for the present study. Location of suicide was noted according to information available in the coroner's autopsy request, police report and, when available, crime scene charts and pictures. Forty-five victims of non-hanging type homicidal strangulation were used as a control group.

For each case, the presence of bruises and lacerations on both lower and upper limbs was noted. Yellow colored bruises were considered as not recent and thus, not analyzed. Each lesion was drawn on anterior and posterior standard anatomical charts. A final chart for all victims was realized by superimposition of each individual chart.

Altogether, 40.6% (CI 95% 33.7;47.5) of suicidal hanging victims (84 cases) presented lesions on either their upper or lower limbs. More specifically, erosions were present in 31.9% of cases (CI 95% 25.3;38.5) (66 cases), while bruises were seen in 19.8% of cases (CI 95% 14.1;25.5) (41 cases). None of the victims presented lacerations of limbs.

The 41 cases presenting limb bruises were further analyzed with regards to the location of victims. The two highest incidences of limb bruises were noted for victims found in staircases and wardrobes, with respectively 66.7% and 56.3%. As a matter of fact, staircase and wardrobe hangings proved to be associated with a higher bruises incidence than any other hanging locations. Furthermore, it should be pointed out that there was no correlation between a location frequency and the bruises incidence.

By superimposition bruises from each individual case on combined charts, anatomical pattern of limb bruises in suicidal hanging was established. The charts clearly demonstrated that bruises in suicidal context are mostly found on posterior part of the right arm and on the anterior aspect of inferior limbs.

Of the 41 cases presenting limb bruises, 36.6% presented bruises on superior limbs, 46.3% on inferior limbs, and 17.1% on both limbs. Of the 22 cases presenting arm bruises, lesions were found on the posterior aspect in the large majority of cases (81.8%). As for the inferior limb bruises, they were located on the anterior part in 84.6%.

When comparing the pattern of limb bruises between suicidal hanging victims and homicidal strangulation victims, the latter are more likely to present with limb bruises (55.6% vs. 19.8%). Furthermore, statistical analyses seem to point toward two criteria suspect of foul play: the presence of bruises on the anterior aspect of upper limb ($\alpha=0.000$, contingency coefficient=0.320) and presence of bruises on both upper and lower limbs ($\alpha=0.000$, contingency coefficient=0.340).

The usual pattern of limb bruises in suicidal hanging will be discussed in relation to the pathophysiology of asphyxia by hanging. Criteria that should alert forensic pathologists to be particularly cautious in the investigation of an alleged suicidal hanging will also be discussed.

Hanging, Suicide, Ecchymosis

321 Study of Relationship Between the Pathological Change of Intima and Internal Elastic Lamina in Human Coronary Artery and the Coronary Heart Disease and Sudden Coronary Death

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This research investigates the relationship between the pathological change of tunica intima and internal elastic lamina (IEL) in human coronary artery (CA) and the coronary heart disease (CHD) and sudden coronary death (SCD). The samples of hearts and CA of 56 cases autopsied in the department of forensic pathology from 1999 to 2001 were selected and divided into three groups. The groups consisted of SCD (21 cases), control group A (17 cases with CHD which did not result in SCD) and control group B (18 cases without CHD and cause of death by violence and/or other natural diseases). The heart and CA were examined by common pathological methods. The CA specimens were taken from the proximal portion of the left anterior descending, embedded by paraffin and stained by H.E. and specific elastic dyeing. The pathological change of intima and IEL in CA were observed by the light microscope and measured quantitatively by computerized image analysis system and statistic methods.

Of 56 cases, there were 46 men and 10 women ranging in age from 21 to 71 (43.6) years old. There were obvious thickened intima and defected IEL in LAD of CA in the cases of SCD and control group A, especially in the SCD group, but only slight thickened intima and a few IEL defects in control group B. The other IEL without defect lost its original curve and became a straight line. The second IEL were found in all three groups in varying percentages of 38% in SCD, 54% in the control group and 67.4% in control group B. There were significant difference in the intima thickness between the SCD and control group B ($P=0.014$), but not between the SCD and control group A ($P=0.149$). There were significant difference of the IEL between the SCD and control group B ($P=0.010$) and between control group A and control group B ($P=0.028$), but not between the SCD and control group A ($P=0.773$). The relationship between the IEL defect and the intima thickening showed a positive correlation in control group A ($r=0.412$, $P=0.021$) and in all 56 cases ($r=0.284$, $P=0.002$), but not in the SCD group ($r=0.014$, $P=0.982$) and in control group B ($r=0.098$, $P=0.570$).

The thickness of tunica intima correlates positively with the extent of IEL defect. There is a relationship between the thickness of the intima and extent of the IEL defect and the CHD and SCD. The formation of the second IEL in CA may be of significance to prevent CHD and SCD.

Sudden Coronary Death, Coronary Artery, Internal Elastic Lamina

152 Study on Vascular Morphology and Biomechanics of Traumatic Subarachnoid Hemorrhage in Acute and Chronic Alcoholism in Rats

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The high mortality of traumatic subarachnoid haemorrhage (TSAH) related to alcohol abuse is a notable risk factor. Here, the authors investigated the vascular morphology and biomechanics of traumatic subarachnoid hemorrhage in acute and chronic alcoholism rats in order to explore the possible mechanisms of TSAH.

Fifty male Sprague-Dawley (SD) rats were randomly divided into acute and chronic model groups. The rats in the acute alcoholism group were intragastrically given edible wine (56% V/V, 15 ml/kg) once. The volume in chronic alcoholism group was 8 ml/kg in the first 2 weeks and 12 ml/kg in last 2 weeks twice every day. The self-made iron pendulum was used to establish the strike model at different time. Whole brain, arterial blood and thoracic aorta of rats were sampled for morphological and biomechanical examination.

The basal blood pressure in chronic alcoholism rats ascended gradually but the body weight descended ($P < 0.05$). Especially, the morbidity and mortality of TSAH of chronic alcoholism rats were significantly high, and the mortality was up to 60.0%. The mean thickness of the vascular wall of subarachnoid small arteries and each layer of thickness of thoracic aorta were determined, and the results showed that the changes of acute alcoholism rats were not significant ($P > 0.05$) but there were statistically significant ($P < 0.05$) in chronic alcoholism rats. In the biomechanical testing, the destructive load and corresponding extensibility (60 kPa and limit load) of the thoracic samples in chronic group decreased, and the elastic modulus (30 kPa, range in physiological stress) increased ($P < 0.05$).

Chronic alcoholism can promote the morphological changes of cerebral vessels and thoracic aorta and induce the alternations of biomechanical parameters of them, which imply that the synergistic effects of alcohol abuse and minor blow may be one of the critical mechanisms of TSAH. In the acute alcoholism group, insignificant changes indicated that there might be some other mechanisms underlying TSAH which deserve further studies.

This work was supported by the National Natural Science Foundation Council of China (No. 30772458).

Traumatic Subarachnoid Haemorrhage, Vascular Biomechanics, Model of Alcoholism

211 Sudden Death Due to Colloid Cyst of the Third Ventricle and a Special Sign at Autopsy: Three Case Reports

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Colloid cysts of the third ventricle are rare, benign cysts of endodermal origin. They may be potentially life-threatening because of acute obstructive hydrocephalous. Three cases of sudden death due to colloid cysts of the third ventricle are presented.

In the first case, the patient was a 24-year-old woman who was treated for migraine headaches. The patient arrived at the hospital with a severe headache and was sent back home after three hours of medical treatment. Six hours later she was found dead in her bed.

The second case was a 21-year-old woman who was treated for migraine headaches for six months. One day prior to her death, she experienced a severe headache, dizziness, and vomiting. She lost consciousness and was transported to the hospital, where she was dead upon arrival.

The third case was a 25-year-old man who had headaches and vomiting, and was diagnosed with sinusitis and treated medically three days before his death. On the third day he lost consciousness and was taken to hospital where he was dead on arrival.

None of the patients had a computerized tomography or magnetic resonance visualization as part of their evaluation. At the autopsy of all three cases, there was a grey trans-illumination area which occurred as a result of stretching of tissue at the base of the brain close to the cyst between the corpus mamillare and chiasma opticum. Dissection of the brain revealed a colloid cyst of the third ventricle and hydrocephalus involving the lateral ventricles.

To avoid such fatal complications, prompt diagnosis using CT or MRI is essential in patients who have a long-standing history of intermittent headaches since colloid cysts are histologically benign lesions that can be removed safely by neurosurgical intervention. In the autopsy of the sudden deaths of people with anamnesis headaches, if a grey color is detected between the chiasma opticum and the corpus mamillare in the base of the brain, a colloid cyst should be considered and this region should be opened and examined carefully.

Colloid Cyst, Headache, Sudden Death

22 The Boiling Technique: A Method for Obtaining Quality Postmortem Impressions From Deteriorating Friction Ridge Skin

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After attending this presentation, attendees will understand the boiling technique and the necessary elements for successfully performing the technique. An example of the practical application of the boiling technique to obtain quality postmortem friction ridge impressions will be addressed as well.

This presentation will discuss the boiling technique, which is a specialized procedure that uses boiling water to recondition friction ridge skin. This reconditioning process rehydrates the skin, enhancing and exposing friction ridge detail. As a result, quality impressions, even from the most distressed bodies, can be recorded and compared to a known antemortem standard or searched through an automated fingerprint/palm print system to verify or establish identity.

Friction ridge impressions are instrumental in establishing the identity of deceased individuals. The forensic examiner must consider the condition of the body and the fact that damage to the friction ridge skin may prevent the effective recording of quality prints using standard fingerprint procedures. The boiling technique is presented as a significant advancement in the recording of quality postmortem impressions particularly in the area of disaster victim identification.

The authors will present their experiences utilizing the boiling technique in Phuket, Thailand after the 2004 South Asian Tsunami as an example of the practical application of the technique. The impact of the presented information on the forensic sciences and/or humanity is the introduction of a fingerprint technique that can be used by medicolegal professionals to record quality impressions from deteriorating friction ridge skin for the identification of deceased persons.

Fingerprints, Postmortem, Disaster Victim Identification (DVI)

635 The Banana Case - Microbial Genotyping

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Microbiologic examinations are a routine part of forensic autopsies, especially in the examination of sudden unexpected death, both in children and in adults. In the examination of sexually abused victims, samples are taken for microbiological examination to search for microorganisms transferred during the alleged sexual assault.

Under these circumstances, in addition to the identification of the microorganisms from different sources, microbiologists, when requested, using various phenotypic and genotypic techniques to find out whether the isolated organisms that belong to the same species or subspecies are clonally identical or closely related. Of the different molecular biological methods, Pulsed Field Gel Electrophoresis (PFGE) is a widely accepted genotypic method, applicable to many different bacteria, and gives accurate, reliable, and reproducible results. The authors report a case of sexual abuse where PFGE was used to determine the clonal relationship of *E.coli* isolated from the patient and the item used to abuse the victim.

A 31-year-old man was admitted to the local university clinic, after he allegedly escaped from a flat where he had been held prisoner against his will. He claimed to have been beaten for hours until he finally managed to escape, naked, with only a duvet around himself. He walked to the local hospital where he reported that he had also been sexually humiliated and that a banana was forced into his anus. The incident happened between 6:00 p.m. on May 2 and 5:00 a.m. on May 3. In the hospital he was treated for rib fractures, small wounds, and bruises. After two days he left the hospital. The police searched the scene at 7:40 p.m. on May 8th, five to six days after the incident. The flat was covered with powder from a fire extinguisher. Small droplets of what appeared to be blood were seen several places in the flat. Among other findings in the flat, a banana was found. The banana, which also was covered with powder from a fire extinguisher, was handled with gloves, and transported in a sealed, clean bag to the crime lab. The banana was brushed gently, to remove the powder, before sampling. No fecal material or blood was visible on the surface of the banana, which was decomposed, soft, and partly black. After a primary sampling, the banana was brought to the forensic section at the university hospital for further analyses that could possibly link the banana to the alleged assault.

The banana, which was heavily decomposed and covered with powder from the fire extinguisher, was swabbed with cotton swabs which were sent to the university hospital's microbiological unit, where the sample was registered eight to nine days after the assault. In the forensic section, some of the swabs were transferred to slides, stained with haematoxylin-eosin and examined under a light microscope by one of the authors. A histological section of the banana skin was also made, but no conclusions could be made from direct microscopic examination except that erythrocytes were present. Testing a small sample with tetrabarsebariumperoxide gave a positive reaction, indicating the presence of blood.

DNA analysis of biological material: The surface of the banana was gently swept with two sterile cotton swabs, which were dried and forwarded to the DNA lab for analysis of possible biological material from the perpetrators. Human DNA was found in the samples, which were further analyzed with DNA/SGM+.

Microbiological methods: The culture of these swabs from the banana surface for bacteria revealed different bacterial strains, but after conferring with the pathologist, attention was focused on bacteria usually found in the anal canal and rectum. Gram negative bacteria were found in all three samples from the surface of the banana, including *E.coli* and *Klebsiella*. It was decided to ask the victim for a fecal sample, to make comparisons between the bacteria isolated from the banana and the bacterial colonists in the lower intestine of the victim. A fecal sample from the victim was received 17 days after the incident and was sent to the microbiology unit where strains of *E.coli* were isolated. As definite conclusions could not be made with phenotypic characteristics of the *E.coli* isolates, it was decided to compare the samples genotypically, by PFGE.

The different isolates of *E.coli* from the banana and the victim were subjected to PFGE technique as described by Pulse Net USA. DNA was digested using the XbaI enzyme and Multi core buffer. Electrophoresis was performed using a CHEF-DR III system, using the following parameters; Initial A time: 2,2 s, Final A time: 54,2 s, Start ratio: 1,0, Volt: 200 V, Run time: 20-22 hours. After electrophoresis the gel was stained with ethidium bromide and photographed under UV-light. Genotypic relatedness, based on the band patterns obtained, was determined visually.

Identical PFGE patterns were found between the *E.coli* isolates from the banana sample and the victim's sample. It was therefore concluded that these *E.coli* isolates were clonally identical or very closely related, in support of his complaint of sexual harassment.

The results from the examination of human DNA from the material on one of the cotton swabs from the banana and the reference sample from the victim revealed identical results in all ten markers, in addition to a male sex marker. The other swab gave identical results in six out of ten markers. DNA from other persons was not found in the samples from the banana.

In the present case, identification of the same strain of a bacterium, namely *E.coli*, as determined by PFGE, was used to establish a link between an item used to assault the victim and the part of victim's anatomy that was exposed to the item in the alleged assault.

PFGE is a technique that checks for identity or similarity of the total genome of bacteria, in order to determine the clonal relationship between different bacterial isolates. Pulsed-field electrophoresis allows the large DNA fragments to be separated according to their lengths, and appear as distinct bands when stained with ethidium bromide and viewed under ultraviolet light. The quantity of DNA in each band is reflected by the intensity of fluorescence under UV light. Thus, qualitative and quantitative assessment could be made of the resulting restricted fragments. Bacterial DNA that are not identical would give rise to fragments that are different in size, and may also give rise to differences in the intensity of bands due to varying numbers of fragments with the same size.

In the present case, the banana was found covered with powder from a fire extinguisher. Nevertheless, traces of blood could be found on the surface. A DNA match between this material and from the victim also was established, as identical markers were found both in the sample from the banana and in the reference sample from the victim. It could be argued that the victim's DNA material could have been deposited there by handling of the banana by the victim at an earlier stage, or that blood from the victim's wounds could have been deposited on the banana. The same could also be the case with the *E.coli* bacteria. There was no visible fecal material in the flat where the incident happened. There is, however, no information that the victim had planted both blood and feces on the banana, but investigation of such possibilities lies in the hands of police and judgment is passed in courts. This case has not yet come to court.

The method has been of limited use in forensic casework in the past, but is emerging as a useful tool.

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Forensic Microbiology, PFGE, Sexual Assault

403 The Time-Dependent Expressions of IL-1 β , Cox-2 and MCP-1mRNA on Blunt Contusion Wounds of Rabbit Skins and the Research on Estimation of Wound Age in the Future

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The proinflammatory cytokines such as interleukin-1 β (IL-1 β), cyclooxygenase-2 (COX-2), monocyte chemotactic protein-1 (MCP-1) play key roles in the inflammatory process during wound healing. The expressions of proinflammatory cytokines increase rapidly after wound was inflicted. These features could make cytokines to be appropriate markers for the evaluation of vitality and early wound age. In this study, the expressions of IL-1 β , COX-2, and MCP-1 mRNA were determined exactly in skin wounds of rabbits using real-time fluorescent quantitative PCR in order to estimate the vitality and early wound age more objectively and accurately.

The 90 rabbits, approved by the ethical committee, were divided into three groups: antemortem injury, postmortem injury, and intact control group. The antemortem group was for <0.5h, 0.5h, 1h, 2h, 3h, 4h, 5h, 6h, 8h, 12h, 24h, 1d, 3d, 7d after blunt contusion, and the postmortem injury group is for 10min, 30min, 1h. The blunt contusion was performed on the ears of animals with a small hammer. The injured skin was excised at the designed time and five specimens were prepared for each wound age point. The specimens as a control group were excised directly from the healthy animals in the same region. Total RNA was isolated from skin specimens using the RNA one-step extraction kit and the first strand cDNA was synthesized according to the standard reverse transcript protocol. The copy number of cDNA was determined by real-time fluorescent quantitative PCR with the sequence-specific primer pairs and probe.

As a result, the levels of proinflammatory cytokines increased with higher wound age on the whole. The expression levels of three cytokines increased in a time-dependent manner after the wounds were inflicted. Compared with control skin, IL-1 β mRNA expression was remarkably increased in early skin wound (<0.5h) and arrived the peak value at 0.5h after injury. COX-2 mRNA expression was obviously increased at wound age of 0.5h ($P<0.05$), MCP-1mRNA expression was remarkably increased at 1h and arrived the peak at 3h ($P<0.05$). There was no statistical significance about the three markers between the different time after postmortem injury and the control group. Furthermore, compared with the data from our laboratory that expressions of the three same mediators were examined on the incised wounds of rabbit skin, the expressions on the blunt contusion were earlier. So the extent of inflicted injury might be an impact factor on the expressions of these markers. It was necessary to estimate the wound age on the blunt contusion.

Real-time fluorescent quantitative PCR is the most sensitive and reliable method for the detection and quantitation of nucleic acids levels. However, in this study the expected satisfying regression equation, which could be used in practice, could not be obtained in spite that many regression methods were used. Therefore, the accurately quantitative method might not be helpful to get more exact estimation for early wound age by a regression equation. The reasons might be that the expression of used markers was influenced by so many factors, such as individual difference and the extent of trauma, so that the rule of expression was not so stable and dependable. The significant expression changes of cytokines were still the appropriate approach to get exact determination of early wound age and more markers with relative stable expression after inflicted wounds should be founded.

In conclusion, the time-dependent expression of IL-1 β and MCP-1 and COX-2mRNA could be regarded as the marker of early wound age for blunt contusion and they could distinguish the antemortem and postmortem injury.

Forensic Pathology, Wound Age Estimation, Blunt Contusion

617 Why are Autopsy Rates Falling in Hong Kong?

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Despite a law reform review process stretching over ten years, the introduction of a "new" Coroners Ordinance in 1997 requiring mandatory reporting of deaths under twenty specific circumstances, the autopsy rates for such cases have declined to an all time low of under 40%. This paper will present the evidence of this decline and discuss some of the factors that may have contributed to the decline. Some of these factors are universally common whilst others may be uniquely Hong Kong. It is hoped that the paper will help to reignite the debate about the issue of autopsies disappearing in not only a clinical setting but also spreading to a medico legal setting.

Autopsy Rate, Coroners System, Decline

19 Relationship of Body Mass Index (BMI) to Minimum Distance From Skin Surface to Myocardium: Implications for Neuromuscular Incapacitating Devices (NMID)

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It is controversial whether NMIDs can induce cardiac arrhythmias in humans. Studies in swine models have shown varying results. Two reported no induced VF, while a third showed 1 case of induced VF during epinephrine infusion. Two studies showed site sensitivity of cardiac capture depending on location of NMID electrodes. Human studies have not shown any induced arrhythmias. However, it is

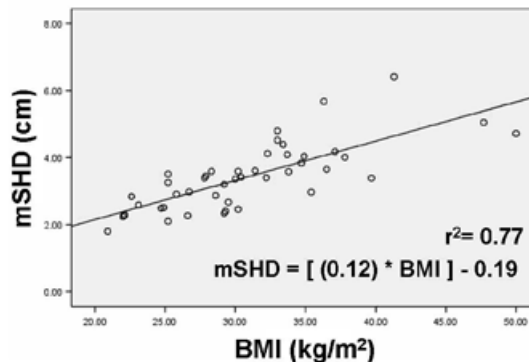
unclear whether electrodes were placed at the most vulnerable regions of the chest. This study sought to assess the thoracic location and range of minimum skin-to-heart distances (mSHD) and its relationship to BMI.

Forty-five patients who had undergone cardiac CT scans were randomly selected for evaluation. These scans were analyzed to determine the mSHD and the location of this point on the chest surface relative to anatomic landmarks (horizontal distance from midsternum and vertical distance from sternal insertion of the lowest left rib). Linear regression analysis was performed using BMI and mSHD.

mSHD ranged from 1.8 cm to 6.4 cm. FIGURE 1 shows the linear regression of mSHD vs. BMI. mSHD was to the left of mid sternum (2.5 ± 2.5 cm) and slightly inferior (0.5 ± 2.0 cm) to the lowest left rib sternal insertion. The area of myocardial contact with the anterior chest wall averaged 51 ± 25 cm², and was unrelated to BMI.

In this study of adults, the average location of the site of mSHD was slightly to the left of mid sternum and just below the lowest rib insertion. There is a linear relationship between BMI and mSHD. The size of a person and the anatomic relationship of the heart to the anterior chest wall can influence the potential cardiac capture by NMIDs at the site of mSHD.

Figure 1: mSHD vs. BMI



Body Mass Index, Neuromuscular Incapacitating Device, CT Scan

57 Analysis of Deaths Due to Allergic Reaction: A Report of 28 Cases in Maryland and Shanghai

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Anaphylaxis is a life threatening allergic reaction that is rapid in onset and may cause sudden death. Death often results from circulatory collapse, respiratory arrest, or both. It affects children and adults in the United State and China.

A retrospective study was conducted on 28 autopsy causes who died suddenly from anaphylactic reaction. Seventeen cases were autopsied at the Office of the Chief Medical Examiner, State of Maryland and 11 cases autopsied at the Department of Forensic Medicine, Shanghai Medical College, Fudan University. For each case, following parameters were recorded: age, sex, details of fatal reaction, medical history, laboratory and autopsy findings, cause of death and manner of death.

The age range was 1 to 81 years with mean age of 42 years in Maryland and 2 to 49 years with mean age of 27 years in Shanghai. Sex ratio (male: female) was 7:10 in Maryland and 7:4 in Shanghai. Of the 17 cases in Maryland, 6 anaphylactic deaths involved reaction to foods, 5 to medication, 2 to bee stings, 1 to hair dye, and 3 to unknown substance. Serum tryptase concentrations were measured in 14 cases in Maryland. The serum tryptase concentrations ranged from 3.3ng/ml to 200ng/ml. Almost all the anaphylactic cases in Maryland were classified as accidental death except for one case certified as natural. Of the 11 cases in Shanghai, 11 deaths (100%) involved anaphylactic reaction to medications, such as antibiotics. Serum tryptase test was not performed on cases from Shanghai. Ten out of the 11 deaths were resulted from illegal medical practice. One patient died shortly after intravenous infusion of Ceftriaxone in a hospital. The manner of death on this case was certified as accident.

Anatomical findings and underlying disease in cases of fatal anaphylaxes were also presented.

There was a significant difference in the etiology and circumstances of death due to allergic reaction between Maryland and Shanghai. Reaction to antibiotics and illegal medical practice were main causes of allergic reactions in Shanghai. Our study indicated that through forensic investigation and complete autopsy (including laboratory tests) are very important to diagnose allergic reaction.

Allergic Reaction, Illegal Medical Practice, Forensic Investigation

64 SIDS - The Cause of Death

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Sudden infant death syndrome (SIDS) is a postmortem medical diagnosis which stands on a "negative autopsy". There are many articles which have reported about the relationship between SIDS and sleeping position. SIDS remains one of the major causes of infant death beyond the neonatal period. Several potential risk factors {including maternal smoking, soft bedding, and covered airways} complicate the picture. Epidemiological research has shown that prone sleeping is a major risk factor for sudden infant death syndrome. Bed sharing and cigarette smoking is associated with a marked increased risk for SIDS as well. Cigarette smoke induces nitric oxide production and retards hypothalamic development by augmented apoptosis.

This presentation offers 10 sudden death cases in babies from 20 days to 1 year. The main cause of death is pneumonia; in one of them we have found compound reason for death (bronchiolitis, pneumonia and meningitis) and in another only meningitis purulenta. Histological findings in the lungs demonstrated a compound viral-bacterial infection (catharral-desquamating or haemorrhagic pneumonia; in 2 cases, purulent pneumonia), hemosiderin-laden macrophages in some alveoles, bacterial colonies, focal thickening of the interstitium with round cells, microhaemorrhages, oedema, emphysema, congestion, and atelectases. We have found these changes also in the case with meningitis.

Most authors have reported the following histopathological changes in SIDS: pulmonary congestion, oedema, microhaemorrhages, an increase of alveolar macrophages, atelectasis, emphysema, bronchitis and pneumonia. These findings are the most common features in almost all our cases.

SIDS, Histological Examination, Cause of Death

69 Evaluation of Postmortem Serum and Cerebrospinal Fluid Growth Hormone Levels in Relation to the Cause of Death in Forensic Autopsy

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Objectives: There appears to be insufficient practical data on postmortem growth hormone (GH) levels to provide diagnostic evidence for determining the cause of death. The present study comparatively analyzed the serum and cerebrospinal fluid (CSF) GH levels in relation to the causes of death in routine forensic work.

Materials and methods

Autopsy cases: (n=117, within 48 h postmortem, survival time <24 h), including cases of blunt injury (n=10), sharp instrument injury (n=8), fire fatality (n=20), asphyxia (n=10), drowning (n=14), hypothermia (n=9), and acute ischemic heart disease (n=46), were examined. GH concentrations were measured using an immunoradiometric assay technique. In these cases, GH immunoreactivity in the adenohypophysis was quantitatively analyzed.

Results and conclusions: The serum GH level was significantly lower in cases of fire fatality with a lower blood carboxyhemoglobin (COHb) level and drowning than in the other groups. The CSF GH level and the ratio of CSF/serum GH levels were significantly higher in fire fatality cases showing a higher COHb level compared with findings in the other groups. GH immunopositivity in the adenohypophysis was relatively higher in cases of fire fatality with a low COHb level, but there was no significant difference among the groups. These observations suggest that elevated serum and CSF GH levels in acute deaths depend on adenohypophyseal dysfunction rather than stress reaction.

Forensic Pathology, Growth Hormone, Hypothalamus-Pituitary-Adrenal Axis

71 Death for Microembolism of Liquid Silicon

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This case presents a 29 years old female walk-in patient to a cosmetic medical center who received an unknown amount of synthetic material (BIOGEL TM) in the buttocks area, in an attempt to change the volume and size of her gluteal region.

About 10 hours after the procedure, the patient had shortness of breath to dyspnea and was brought to an emergency room. The medical staff ruled out pulmonary thromboembolism, adult respiratory distress syndrome, and pulmonary infectious syndrome, plus an exogenous embolism. Five days after the onset of the initial symptoms, the patient died. Her relatives ask to perform an autopsy.

During the autopsy, the body presented heavy, hard, and congestive lungs with diffuse alveolar damage. The brain displayed punctuate hemorrhages on the white matter in a similar pattern as seen in a fat embolism. A conspicuous amount of free liquid silicon was found in

the soft tissues of the buttocks. On the microscopic examination, the H&E stained slides demonstrated abundant bubbles of silicon in brain, lung, blood vessels, and kidney.

The injected material was confirmed by the toxicology and biochemistry laboratory as silicone. The injections of synthetic materials have been used to improve the physical aspect of people for some time. This practice has been considered illegal due the risks for the human health and the huge amount of early and delayed complications.

Biopolimeres, Microembolia, Death in Procedure

82 Bullet Embolization to the Right Atrium

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Intravascular bullet embolism is an uncommon complication of penetrating gunshot wounds, with just over 200 cases reported in the past 170 years. Although approximately one-quarter of these involved migration to the right side of the heart, the right atrium was the final destination in only five cases. This study presents a sixth case of bullet embolization to the right atrium, discovered five years after the initial trauma.

A 40-year-old man with history of a gunshot wound to the left chest presented with right lobar pneumonia. He was admitted to the intensive care unit and treated with broad-spectrum IV antibiotics, but succumbed 18 hours later to *Klebsiella pneumoniae* sepsis. Autopsy revealed acute lobar pneumonia and alcoholic cirrhosis. Additional findings included a left lateral chest scar and significant anterior, posterior, and lateral left pleural adhesions. Gross examination of the heart revealed a smooth unremarkable pericardium and epicardium, intact atrial and ventricular walls, a smooth yellow-orange linear area within the posterior-lateral left ventricular myocardium, which was histologically consistent with collagenous scar, and a bullet surrounded by fibrous tissue within the wall of the right atrium at the level of the posterior tricuspid annulus. The aorta and its major branches were intact and without abnormality. Five years prior, he had presented to the same emergency room after being shot in the left chest with an unknown caliber weapon. At that time, he complained of localized chest pain and mild shortness of breath. He was managed conservatively with a thoracostomy tube. Chest roentogram showed the bullet within the anterior mediastinum. He was discharged home in stable condition, but was lost to follow-up until presenting with the pneumonia.

Bullet embolism was once considered a very rare complication of gunshot wounds, but a substantial increase in the number of reported cases in the last decade has altered this belief. Arterial, venous, and paradoxical emboli have all been reported, with a variety of entry sites and destinations. Vascular entry with subsequent embolization requires a small bullet diameter and low kinetic energy. Those that penetrate the venous system have potential to travel in an antegrade fashion into the right heart. An embolic event should be considered in any gunshot wound victim with no exit wound and signs and symptoms unexpected for the presumed pathway of the bullet. In addition, a blurred bullet within the cardiac silhouette on chest radiograph in a hemodynamically stable gunshot wound victim is suggestive of an intracardiac bullet without direct penetration of the heart. A right ventricular or atrial bullet may remain inconsequential, firmly encapsulated in fibrous tissue, or produce myocardial instability, endocarditis, valvular dysfunction, or embolize further downstream.

Bullet Embolus, Gunshot Wound, Cardiovascular

121 Are the Malignancies Developed in Chemical Warfare Victims Behaviorally and Biologically Different From the Ordinary Ones? A Prospective Post-Mortem Study

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Chemical weapons were the first weapons of mass destruction to be invented. Although many reports and documents could be found in the ancient history about use of different chemical agents in wars, the modern history of chemical warfare (CW) traces largely to the Germans who were leaders in industrial chemistry at the beginning of the 20th century. Consequently, when the First World War broke out, they logically used their chemical expertise to develop weapons and the use continued in the 2nd World War. Fritz Huber was a world-famous chemist who developed poison gases for Germany during the First World War and has been labeled as the father of CW.

Chemical weapons were also used by Saddam Hussein during IRAN-IRAQI Conflict as well as during the Gulf War. Many people were killed and many more were wounded in fighting the numerous early and latent complications of these notorious agents.

All victims of CW in South IRAN referred for determination of definite cause of death and the extent of relation with CW effects during a 10-year period (1995-2005) have been autopsied and this study presents the forensic-pathologic results.

Materials And Methods:

Fifty-two (52) bodies with history of CW exposure were autopsied and all internal organs eviscerated for histo-pathological as well as toxicological studies. Nine cases showing malignant visceral lesions in the preliminary reports were selected for further immuno-histochemical as well as molecular – biological studies.

Results: Nine out of 52 victims of chemical warfare (17.3%) developed visceral malignancies. The age of the CW victims ranged from 31 up to 60 years (mean age: 45 years). All (100%) were male. Pulmonary edema, bronchiectasis and varying degrees of broncho-pneumonitis are the most common pathologic findings, although wide range of hepatitides as well as cirrhosis, ischemic heart lesions and visceral malignancies are striking histopathologic features. The malignant lesions were subjected to immuno-histochemical studies. The specimens are also well preserved for near future molecular biological studies.

List Of Malignancies Detected In Chemical Warfare Victims:

1. Malignant Non-Hodgkin's Lymphoma, Diffuse Large Cell Variant, B-Cell Type (High Grade), 4 Cases.
2. Acute Myelogenous Leukemia (Aml-M2), 1 Case.
3. Malignant Melanoma, 1 Case.
4. Glioblastoma Multiforme, 1 case.
5. Immuno-Proliferative Small Intestinal Disease (IPSID), 1 Case.
6. Squamous Cell Carcinoma Of Urinary Bladder, 1 Case.

Conclusions: Regardless of direct cytotoxic effects of chemical war gases, these destructive agents cause long term and latent hazardous effects, most notably different variants of malignancies. The rate of B-cell lymphomas in CW victims is much more than expected in the general population. Markedly much more invasiveness, as well as other aggressive clinical and biological behavior of the neoplasms detected in the study group in comparison with similar tumors in non-CW patients, may tell us about the ever unknown cytopathic effects of these agents to be clarified in future molecular-biological studies.

Chemical Warfare, Malignancy, War Gases

124 Sudden Death Following a Struggle During Arrest by the Police: Four Autopsy Cases

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Sudden death during or immediately after a struggle is a difficult issue for forensic pathologists, due to a lack of anatomical evidence regarding the cause of death. Such a death during a struggle with police is especially of social importance. We report 4 autopsy cases of sudden death following a struggle during arrest by the police.

Case 1: A 39-year-old black male with a BMI of 25.8 was arrested by the police for illegally overstaying his visa. He died suddenly after being restrained for about 5 min, finally being restrained by a strangle-hold with his face down and his hands behind his back. The heart (390 g) showed no evident coronary or myocardial lesion, although histology demonstrated myocardial fragmentation in the left ventricle. Pulmonary congestion and edema were evident. There was no evidence of ethanol or drugs.

Case 2: A 40-year-old male with a BMI of 39.8 was arrested by the police for groping a woman. He died suddenly after being restrained for about 8 min, finally being restrained by a strangle-hold with his face up. The heart weighed 530 g, and showed minor coronary atherosclerotic plaques. Histology demonstrated myocardial fragmentation in the left ventricle. Pulmonary congestion and edema were evident. There was no evidence of ethanol or drugs.

Case 3: A 42-year-old male with a BMI of 40.4 was arrested by the police for violent behavior. He died suddenly after being restrained for about 5 min, being restrained by a strangle-hold with his face down and his hands behind his back. The heart weighed 555 g and showed mild coronary atherosclerosis and stenosis. Histology demonstrated myocardial fragmentation in the left ventricle. Pulmonary congestion and edema were evident. Cardiac blood ethanol levels were 1.84 mg/ml in the left and 1.67 mg/ml in the right. There was no evidence of drugs.

Case 4: A 39-year-old male with a BMI of 27.7 was arrested by the police for drug abuse and violent behavior. He died suddenly after being gagged with a towel with his face up. The heart (385 g) showed no evident coronary or myocardial lesion. Histology demonstrated myocardial fragmentation in the left ventricle. Pulmonary congestion and edema were evident. Amphetamine and methamphetamine levels were 0.075 $\mu\text{mol/dl}$ and 0.390 $\mu\text{mol/dl}$ in heart blood, respectively. There was no evidence of ethanol.

Two subjects (cases 2 and 3) were obese and had hypertrophic heart, but without evident coronary lesions. One subject (case 3) was alcoholic and another subject (case 4) was a drug abuser. Two subjects (cases 1 and 3) were restrained face-down with the hands behind the back, and one subject (case 4) was gagged. Three subjects (cases 1-3) were restrained with a strangle-hold using a judo technique to control violence by inducing fainting. A combination of these factors may have caused acute cardiac dysfunction during or following the struggle.

Sudden Death, Struggle, Forensic Pathology

140 Neonatal Intrapericardial Teratoma: A Case Report

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The differential diagnosis of an anterior mediastinal mass lesion in a neonate includes thymomas, lymphomas, abscesses, and teratomas. Of these possibilities, mediastinal teratomas are extremely rare, less than 20 have been reported within the last fifteen years. Exact diagnosis requires histologic examination, because although prenatal imaging studies may alert to the possibility of a mass lesion, imaging alone cannot determine what types of tissues may be present within the lesion.

Case presentation

The case of a 17-year-old woman, who received little prenatal care, that delivered a living male infant with a suspected mediastinal teratoma of unknown histologic subtype.

Conclusion

The neonate was diagnosed with an intrapericardial immature teratoma histologic grade two. This lesion occupied approximately 80% of the thoracic cavity. Prenatal diagnosis of mediastinal mass lesions is becoming more common, thanks to routine prenatal ultrasound and advanced fetal imaging modalities such as magnetic resonance imaging. Although helpful, imaging modalities cannot provide an exact diagnosis of a mediastinal mass, but they can define size, site, and extension. Intrapericardial mediastinal teratomas are extremely rare, and certainly fatal, if they are not detected prior to delivery. The mainstay treatment is complete excision immediately after delivery, because conservative measures do not provide a durable and favorable outcome. These infants can fare quite well if surgery is completed successfully.

Teratoma, Mediastinal Mass, Intrapericardial

144 Traumatic Basal Subarachnoid Hemorrhage Caused by a Beer Can

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In forensic pathology it is well known that minor to moderate blunt trauma to the base of the head or neck can cause a traumatic basal subarachnoid hemorrhage by lesion of the intracranial basal brain arteries or vertebral arteries in the neck. This study presents the case of a 51-year old woman who, during a longer binge drinking in an apartment with her boyfriend and three other male companions, lost consciousness. In the evening there had been a quarrel with her boyfriend and he had supposedly slapped her in the face, which caused her to leave the apartment. In the staircase she stumbled and fell down a flight of stairs. She was carried back into the apartment. After a while it was noticed that she was unconscious and an ambulance was called. On arrival, the paramedics registered asystole and death was pronounced at the emergency room. At the scene there were large amounts of empty and full beer cans and bottles.

At the medico-legal autopsy, a patterned C-shaped contusion wound with an underlying subcutaneous hemorrhage on the neck under the right ear was noted. Similar contusion wounds were found on the right hand and under the right eye. Dissection revealed a fracture of the right transverse process of the first cervical vertebra and a subarachnoid hemorrhage at the base of the brain. Her boyfriend was interrogated and admitted to having thrown full beer cans at the alcohol-intoxicated victim while she was sitting/lying on the couch. Crime-scene technicians found a beer can with traces of blood at the scene and the shape of the bottom of a beer can was matched with the C-shaped lesions on the victim. The cause of death was assumed to be the traumatic basal subarachnoid hemorrhage caused by blunt trauma to the neck, which resulted in fracture of the first cervical vertebra and lesion of an artery. The perpetrator was charged with violence and sentenced to seven years imprisonment.

Trauma, Basal Subarachnoid Hemorrhage, Contusion

162 PMI Simulating Study on Parameters of Active Ratio in the Corneal Endothelium

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Introduction: Approaches used to determine postmortem interval (PMI) can be classified into the following groups: measuring the temperature of cadaver; integrating phenomenon of dead body; and so on. But these methods are not very accurate because too many factors are involved, such as environmental temperature and degree of decay. It has been found that the activity ratio in corneal endothelium cells can reduce gradually along with the prolongation of PMI. Therefore, it is necessary to investigate the effects of environmental temperature upon the characteristic parameters of active ratio in corneal endothelium cells in cadaver and its significance in finding a new simple and reliable method to judge the PMI.

Method: By calculating the equation of Calculated active ratio in Cornea endothelium cells and establishing the anti-S curved model, it was possible to investigate the simulated changes of active ratio in cornea endodermis cells in 500 cadavers under different environmental temperatures between the ages four to 71 with known PMI who had no cornea disease.

Placed the slices of distinct endothelial cells under microscope by magnifying 10 times. It could be observed that the endothelial cells of cornea was hexagon under the microscope and the dead endothelial cells had nucleus, but the active ones had none. Active cell was about 5µm in thickness and 18-20µm in width (see Photo 1).

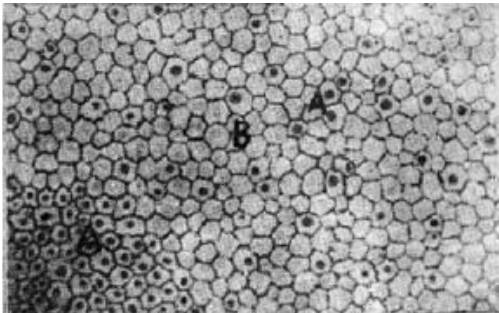


Photo1. Corneal endothelial cells under microscope (A: dead cells, B: active cells)

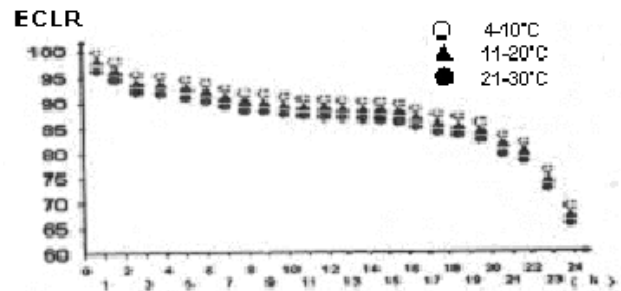


Figure 1. ECLR curve under different temperature environments.

Results: The correlation index of the anti-S shape curved model of active ratio of cornea endodermis cells in cadaver versus death time was over 95% and the residual standard deviation was not more than 0.5. It was also found that the higher environmental temperature, the shorter the survival time of corneal endothelium. When the Q value increased, the values of a1 and b1 decreased and the active time of cornea endodermis cells in cadaver became shorter. However, when the Q value decreased, the values of a1 and b1 increased and the active time of cornea endodermis cells in cadaver became longer.

Conclusion: The quantitative change patterns of active ratio in corneal endodermis cells in cadaver under different environmental temperatures were elucidated so as to take advantage of the changes of characteristic parameters to propose the rationales for estimating the postmortem interval (PMI).

PMI, Active Ratio in Corneal Endothelium, Characteristic Parameter

170 Cell Stress Markers in Cases of Sudden Unexpected Death in Infancy

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Results will be presented from a study looking for genetic variations in the cellular stress response systems.

Sudden and unexpected infant death has been associated with hyperthermia, which is a situation with cellular stress. It was the goal of the researchers to test for activity in the genes coding for proteins in the cellular stress-response and anti-oxidant systems in cases of Sudden Unexpected Death in Infancy (SUDI) by setting up an experiment that mimics stressful events.

The study is set up as a case-control study. Cells from children who died of unnatural causes were compared with cells from children who died suddenly and unexpectedly or where post-mortem examinations could not reveal the cause of death.

Fibroblast cultures have been established from Achilles-tendons sampled during autopsies of children from 1989 to 2005. The material provides an opportunity for performing functional analysis on cells harvested from individuals who died from unexplained causes.

The fibroblasts were cultured and exposed to hyperthermic conditions (40 °C). In order to follow the stress-response of the cells, they were harvested at several time points over a period of 24 hours. Selected stress response genes (Hsp70, Hsp60, HO-1, and SOD2) were monitored using quantitative real-time PCR methods to measure the amount of mRNA expressed under both stressed and unstressed conditions.

Sudden Infant Death, Cell Stress Response, Fibroblast Cultures

213 Sudden Unexpected Infant Deaths Implications for Future Prevention

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During the last decade, much attention has been paid to the risk factors of Sudden Infant Death Syndrome (SIDS). The Office of the Chief Medical Examiner (OCME) has recorded a significant decline in the death rate of SIDS from 1.19 per 1000 live births in 1990 to only 0.32 per 1000 live births in 2000 in the State of Maryland. Since 2000, as the rate of SIDS dropped in Maryland, the occurrence of related diagnosis, such as "undetermined" and accidental asphyxia cases have increased considerably. To better understand, and ultimately prevent, sudden unexpected deaths in infancy, this study was undertaken to elucidate circumstances and conditions that may lead to such deaths.

A retrospective study of autopsy cases from the Office of the Chief Medical Examiner yielded a total of 202 infant fatalities in the State of Maryland during 2003 and 2004. Thirty-seven infant deaths were determined to be SIDS, which represented 15.8% of the total infant deaths in our study population. The black infant SIDS rate (0.39 per 1000 live births) was much higher than that of white infants (0.18 per 1000 live births). Forty-three (21%) deaths were due to natural diseases, 24 (12%) deaths were from accident, and 15 (7%) deaths were the result of homicides. The manner of death could not be determined in 41% (86/206) of the cases, in which the cause of death was listed as Sudden Unexplained Death in Infancy (SUDI). Sudden unexpected infant deaths most often involved infants who were male and black. SIDS (N=37) was the most common natural cause of death in infants, followed by pneumonia (N=12), complications of prematurity (N=7), congenital heart disease (N=6), and myocarditis (N=3). The most common cause of accident in infants was asphyxia due to overlay (64%) (N=16/25) when the infants were co-sleeping in bed with another person or persons. The majority (75%) (N=12/16) of asphyxiated co-sleeping infants were black. More than 60% of co-sleeping infants had a crib or bassinet available at home. Black infants were four times more likely to become homicide victims (80%) than white infants. Blunt force injuries were the most common cause of infant homicide in Maryland, followed by suffocation/smothering and malnutrition due to neglect. The perpetrator was often the father or a boyfriend, and /or to a lesser extent, the mother or female babysitter.

This study focuses on the characteristics and scene investigation findings of sudden unexpected infant deaths. The shift of diagnosis in sudden infant death investigation is also presented.

Sudden Infant Death, Asphyxia, Forensic Investigation

206 Estimation of Post-Mortem Interval From Ear Temperature Taken by Infrared Ray Technique

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The purpose of the paper is to confirm the reliability of the infrared ray temperature testing technique in measuring ear temperature to deduce the death time. During the period of July to November, 2005, continual temperature measurement of the ear, brain, rectum of adults' corpse with their death time known or post-mortem (within 4-8 hours) were made using infrared technique and other temperature measurement at the Judicial Expertise Centre of Beijing Municipal Public Security Bureau. The total number of the corpse measured is 30, aged from 15 to 82, with average age 39.1 ± 14.5 . There are 25 males and 5 females; the ratio for them is 1:5. Their height is from 155cm to 194cm, the average height being 170.2 ± 7.2 cm; their weight ranges between 50kg and 100kg; the average weight is 68.9 ± 10.8 kg; the scope for body surface area is between 1.4160m² and 2.3157m²; the average area is 1.781 ± 0.1816 m²; body-shape factor is within the scope of 0.0230 and 0.0300; its average is 0.0264 ± 0.0016 . The study comes to the conclusion that there is no remarkable difference on accuracy to deduce post-mortem interval after death of 10h, 15h, and 20h using the equation of estimating FMI by ear and brain temperature. ARE for estimation of post-mortem interval by ear and brain temperature has been cut down obviously, compared with the one of rectum temperature nomogram, namely $P < 0.01$. So it is concluded that infrared ray ear temperature measuring can be substituted for brain temperature measuring for the estimation of the death time.

Infrared Ray Temperature, The Estimation Of Post-Mortem Interval, Ear Temperature, Brain Temperature

194 Sudden Unexpected Death Due To Undiagnosed Leukemia: A Forensic Autopsy Study And Review Of Literatures

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Sudden unexpected deaths caused by clinically undiagnosed leukemia are rarely reported in the literature. A 3-year retrospective study of autopsy records from Department of Forensic Pathology, Institute of Forensic Science, Shanghai, was conducted. Three cases of sudden unexpected deaths due to previously undiagnosed leukemia were documented.

Case 1 was a 24-year-old male who was admitted to the hospital with complaint of severe headache after he was struck on his head by a blunt object. An urgent CT scan at admission revealed no evidence of intracranial injury or hemorrhage. His condition deteriorated during hospitalization with worsening headache and nausea. A repeat CT scan showed diffuse acute intracerebral hemorrhage on the 16th day. He died the next day despite life support treatment. A forensic autopsy was requested by the family to determine the cause of the intracerebral hemorrhage and its relationship to the head trauma. Postmortem examination revealed that there was a 3.5cm healing laceration associated with underlying subgaleal hemorrhage over the mid parietal scalp with no skull fracture, subdural or epidural hemorrhage. The brain showed a 4cm x 3cm x 3cm hemotoma in the right parietal lobe and multiple areas of hemorrhages in the left frontal and parietal lobes. Further histological examination revealed numerous immature lymphoblastic cells infiltrate within the hemorrhagic areas of the brain. The cause of death was certified as acute intracerebral hemorrhage. The acute leukemia was the underlying cause of death, while the head trauma served as a contributory factor to his death.

Case 2 was a 40-year-old male prisoner with no known medical history who presented to the jail clinic for headache with fever and vomiting. He was treated with antibiotics but with no improvement. Later he was transported to a local hospital where he died shortly after arrival. An autopsy was performed because the death was unexpected. Examination showed diffuse petechial hemorrhages in both upper and lower extremities, the axilla and the posterior torso. There was a 5cm x 4cm x 3cm hemorrhage in the right parietal lobe and subarachnoid hemorrhage with lateral ventricular hemorrhage. The spleen was enlarged and weighed 728 grams. No evidence of trauma was noted. Histological examination revealed immature lymphocytic cells infiltration in the brain, spleen, liver, heart, kidneys and lungs. The cause of death was intracerebral hemorrhage due to acute lymphocytic leukemia.

Case 3 was a 30-year-old female who was found deceased in her residence. She had no known medical history. There were several bruises noted on her both arms and right thigh. At autopsy, a diffuse hemorrhage was present in the frontal and temporal lobes of the brain. The liver and spleen were enlarged and weighed 1800 and 630 grams respectively. Histological examination revealed infiltration of immature myeloid cells in the brain, lungs, spleen, and liver. She died of intracerebral hemorrhage due to acute myeloid leukemia. These cases demonstrate that leukemia patients may have minimal or no symptoms in the presence of significant diseases and illustrate the importance of a through autopsy examination including histological study in the cases of sudden unexpected deaths associated with intracerebral hemorrhage.

Sudden Unexpected Death, Leukemia, Forensic Autopsy

251 Study on Relation Between the Changes of tPA & MMP-9 Expression and Traumatic Subarachnoid Haemorrhage in Brain of Acute and Chronic Alcoholism Rats

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Objective: The objective of this study was to observe the expression of Ngf, Hif-1 α and the activity of Na⁺/K⁺-ATPase in alcoholism induced rat brain tissue. The models of acute and chronic traumatic subarachnoid haemorrhage (TSAH) were compared to discuss the effect of alcohol to oxygen metabolism of brain tissue and its possible relationship with the mechanism of TSAH.

Methods: One-hundred and thirty-four male SD rats (250~350 g) were randomly divided into six groups. The acute alcoholism group and sham chronic group were intragastrically administered ultrapure water instead of alcohol. The rats of the acute alcoholism group were administered edible wine (56% V/V) 15 ml/kg once. Those of the chronic alcoholism group were given eight ml/kg in the first two weeks and 12 ml/kg in last two weeks twice every day with six hours intervals. Seven rats in each of the sham acute group, acute alcoholism-and-TSAH group, and acute alcoholism group were killed at 0.5h; 2h; 4h; 6h; and 12h. The self-made iron pendulum was used to duplicate the rat's model of TSAH with concussive heating. The whole brain of rats was sampled to observe the expression of Ngf and Hif-1 α by immunohistochemistry and the activity of Na⁺/K⁺-ATPase was determined by spectrophotometry.

Results: The mobility of TSAH was 28.6% and 82.4% respectively in the acute alcoholism-and-TSAH group and chronic alcoholism-and-TSAH group. The expression of Ngf increased in the IOD of Ngf in the acute alcoholism-and-TSAH group. The acute alcoholism group and chronic alcoholism group were also significantly higher than the sham group (P<0.01). The number of positive cells and IOD of Hif-1 α in the same three groups were also significantly higher than the sham group (P<0.01). The activity of Na⁺/K⁺-ATPase in the acute alcoholism group was obviously lower than the sham group at 2 - 4h (P<0.01), and which in chronic alcoholism group was higher than acute alcoholism group at 2h (P<0.01), but lower than the sham group (P<0.05).

Conclusions: In the condition of hypoxemic brain tissue related with alcohol, Ngb, Hif-1 α compensatively increased and the activity of Na⁺/K⁺-ATPase declined. It is suggested that the alcoholism is related with the obstruction of oxygen supplication and energy metabolism of neuron and the sodium pump's serious malfunction. The effect of neurotoxin could be one of the mechanisms of encephalopathy caused by long-term drunkenness and vulnerability in TSAH.

This work was supported by the National Natural Science Foundation Council of China (No. 30772458).

Traumatic Subarachnoid Haemorrhage, Alcohol Abuse, Na⁺/K⁺-ATPase

261 Death Following Blunt Trauma to the Neck

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A 73-year-old woman was walking her dog. She had a quarrel with another dog owner, a 46-year-old male. According to a witness, the male suddenly hit the woman several times with his hand on the right side of her neck and head. She tottered to a nearby stone to sit down and collapsed shortly thereafter. The witness called for an ambulance. Resuscitation attempts were in vain. A medico-legal autopsy including microscopy demonstrated subcutaneous haemorrhage in the upper right side of the neck, haemorrhage around the right submandibular gland, and haemorrhage around the carotid bifurcation and in the carotid wall. In addition, scattered subcutaneous haemorrhages were found on the body. Furthermore the autopsy revealed severe arteriosclerotic coronary arteries and a moderate hypertrophic heart. The cause of death was assumed to be traumatization of the carotid sinus with subsequent reflexogenic parasympathetic activation leading to a lowered blood pressure and cardiac arrest in this elderly woman with an underlying arteriosclerotic heart disease. The perpetrator was sentenced to six months imprisonment. The pathophysiology of this rare fatal course of events will be discussed.

Neck Trauma, Carotid Sinus, Reflexogenic Death

270 Injuries and Deaths Caused by Mole Guns

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In Turkey, mole guns are commonly used to kill detrimental animals. They sometimes cause injuries, sometimes lethal, and are occasionally used in crimes. A mole gun propels pellets similar to a shotgun. In this study, 24 cases of injuries in Konya between 2004 and 2007 and four cases of deaths in Konya, Burdur, Erzican, and Denizli, all caused by mole guns, were analyzed.

In the cases involving injuries, 23 were males and one was a female. Their ages ranged between two and 80 years, with an average age of 50.8 \pm 17.7 years. The most crowded age group was 60-69 years with eight cases and 19 of the cases were farmers. In 21 cases, the injuries involved the right or left hand. In 14 of the cases, there were amputations at various levels involving one or more fingers. Fifteen of the injuries occurred while setting the gun.

The manner of death was an accident in three of the cases and one case was a homicide. With respect to the accidents, two involved injuries while setting the gun and one involved an injury when controlling the gun. With respect to the homicide, the victim sustained an injury to the neck. In the accidental cases, the victims were injured in the right thigh, the abdomen, and the chest. The victim with the abdominal injury died at the hospital and the other two victims died at the place of accident.

In conclusion, because the mole gun may cause various disabilities and lethal wounds in humans when fired from a short distance, it is believed that its production and use should be prohibited.

Mole Gun, Firearm, Death

271 Dead Bodies Found in the Wells

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A well is usually a cylindrical pit with an encircling wall panel that is excavated until water is reached for the purpose of then using the water. Large pits in which limestone is slaked are referred to as lime pits. Corpses found in wells are important in terms of identification and the subsequent determination of the cause and manner of death. People may accidentally fall in wells where safety measures have not been taken. Some victims may use wells for the purpose of committing suicide. Also, corpses of homicide victims may be thrown into wells for concealment.

In this study, the 3912 death examinations and autopsies performed at The Konya Branch of Forensic Medicine Council (Turkey) between 2000 and 2007 were investigated retrospectively and it was found that 18 (0.46 %) of the bodies had been recovered from wells. The cases were evaluated in terms of their demographic features, manner of death, autopsy findings, cause of death, and the characteristics of the wells in which they were found. The ages of the victims varied between four and 74 years and the average age was 40.4 years. Sixteen cases were males and two were females. The manner of death was determined to be accidental in 10 cases, suicide in six cases, and homicide in two cases. Death had occurred as a result of drowning in water in seven cases. While accidental and suicidal cases were taken out of the well on the day when the death occurred, one of the homicidal cases was found in the well nine days later and the other case 1.5 months later, following a confession of the defendant. Fifteen of the wells in which corpses were found were freshwater wells and three were lime pits.

In conclusion, a comprehensive scene investigation and autopsy must be performed in corpses recovered from wells for identification and the subsequent determination of the cause and manner of death. The covers and tops of wells should be kept closed at all times to reduce deaths originating from accidental falls in wells.

Well, Death, Forensic Medicine

335 Self-Ingested Pesticides in Crete Island

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Introduction: Each year, nearly 900,000 deaths worldwide are due to suicide, which accounts for more deaths than homicides and wars combined (WHO 2006). Pesticide ingestion is one of the leading suicide methods resulting in an excess of 250,000 deaths. It is estimated that in the last decade between 60% and 90% of suicides in China, Malaysia, Sri Lanka, and Trinidad were due to pesticide ingestion. In the island of Crete, with a mean age-standardized suicide rate of 6.9/100,000 habitants over an 8-year period (1999-2006), intoxication with pesticides constitutes the second most popular suicide method.

Aim of the study: The purpose of this study was to access the characteristics of suicide by pesticides intoxication on the Island of Crete, Southern Greece, as they were recorded at the Department of Forensic Sciences, Faculty of Medicine, University of Crete, Greece in order to restrict this phenomenon by taking the appropriate precautionary measures.

Materials & Method: All suicides cases by pesticides ingestion recorded in Crete during the period 1999-2006 were included in the study (n=80). Data were collected from the records of the Department of Forensic Sciences, Faculty of Medicine, University of Crete.

Yearly and mean age- and sex- specific suicide rates were calculated per 100,000 population, in ten-year age groups. The total suicide rates by pesticides for males and females were age-standardized on the Greek population of census year 2001. Cases were divided according to the type of pesticide and toxicological findings. Comparisons of suicides among urban and rural areas were also made. Since there were not many studies on the subject in Greece, comparison was made with the only available data from Epirus region, South-West Greece.

Results: From 1999 to 2006, 80 out of 326 (24.54%) suicides performed were recorded as suicide by pesticides while in almost half of the cases (45%) carbamates were used. A mean age-standardized suicide by pesticides rate of 2.53/100,000 for males, 0.85/100,000 for females and 1.7/100,000 for the total population was demonstrated. The victims were 76.3% male and 23.8% female. Suicides by pesticides in Crete totaled 80 for an eight year-period (in a population of 601,131 people), while in Epirus, nine for a seven year-period (in a population of 352,420 people), which indicates a higher preference in ingesting pesticides as a suicidal method in Crete.

Discussion: The available data suggest that acute pesticide poisoning has been a major problem in Crete for many years and that it should be a major public concern today. It is estimated that the suicide rate with the use of pesticides is 4.4 times higher in Crete (1.7) than in Epirus (0.38). The use of pesticides in suicidal actions seems to be in worrying levels at the region of Crete and precautionary measures need to be addressed in order to strengthen and support the network for monitoring suicide and to identify the factors leading to this phenomenon.

Suicide, Crete, Pesticides

336 Forensic Deaths in the Soldier Population

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Deaths in the soldier population, which consist of young and active individuals, require forensic examinations. Deaths during the obligatory military service at a certain age, as is the case in Turkey, are the center of interest for the society.

The autopsy reports of 100 military personnel autopsied during 2002-2006 in the Gülhane Military Medical Academy, Department of Forensic Medicine, were evaluated according to sociodemographic characteristics, cause and manner of deaths, and medico-legal findings. Of the 100 cases subjected to forensic autopsy, 96 (96 %) were under 35 years old and were considered as "young deaths". It was determined that the rate of death due to firearms was 38 % among traumatic deaths, the most common cause of natural deaths was cardiac by 52 %. Of the cardiac deaths alone, 77 % were associated with exercise. However, cardiac conduction system abnormality was the most common cause of sudden cardiac deaths.

Military training includes a considerable amount of discipline and effort, to which individuals are not familiar. Thus, the high rate of some causes of death requires further investigation.

This study aims to define the autopsy findings of traumatic and non-traumatic military deaths concerning forensic features.

Forensic Deaths, Soldier, Autopsy

365 Some Aspects Related to Suicide in Our Area

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Introduction: Suicide is a contemporary phenomenon with causes that are not always clear. It also preoccupies the medical world because it is situated in the top 10 causes of death.

Materials and Methods: In Romania, the rate of suicide is 12.7/100,000 people with 17-18/100,000 in Timis county, a value over the national average. Here, in the last five years, 510 cases were examined as possible suicides.

Results and Discussions: In this area, about 100 cases of suicide per year were found with a male-female ratio of 3-6:1. The men resorted to hanging in 85% of the cases, use of a deadly weapon (knives, guns, hunting rifles) 10%, and other means in 5%. In comparison, women resorted to hanging in 60% of the cases, medicine overdose or mixed in 30%, and other means in 10%. The age of the suicide victims greatly varied, with many cases at an adult age. However, adolescent and senior suicide victims were also encountered. The cases of suicide were analysed with an attempt to position them in the "suicide as abandoning life" scheme, which has three main risk groups: emotionally isolated persons with frustrations and professional failures (forced retiring, unemployment, very low or absent income); patients with incurable diseases or diseases which isolate them from their families; and persons who go through emotionally shocking events (death of loved one, divorce, rejection by offsprings).

Conclusions: The analysis of the suicide cases show that that the male gender is much more affected, being a risk factor for death at an early age. Suicide represents an element that affects the active population, especially in the context of the high frequency of such cases in our socio-cultural area.

Suicide, Risk Factors, Characteristics

416 A Case Report of Death Due To Hanging

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Hanging is the most frequent method of death. The end result is mechanic asphyxia and the general intention is suicide. Hanging in which the whole body is in free suspension, depending on the rope, is called complete hanging. Incomplete hanging is a case in which the knee, foot, or other body parts touches the ground. Death due to hanging is the end result of many or some circumstances coming together. Furthermore, these mechanisms can be divided into three parts: the first is reflex asphyxia due to pressure on sinus caroticus; the second is mechanic asphyxia due to pressure on the airway (trachea); and the third is due to lesion on the medulla spinalis due to hanging. In both hanging methods, injury to the medulla spinalis is very common.

Complete hanging is a case in which an individual hangs him/herself from a high place or position (freefall position) with rope. The kinetic energy resulting from the body weight and falling from high a place, even in very resistant places like the neck, results in cervical vertebra trauma, dislocation, and separation.

This is the case of a 32-year-old man found in an elevator space in his apartment. One end of the rope is around his neck, while the other end of the rope is tied to the roof of the building. The complete hanging ends within three meters of free fall.

Observations were made during the physical examination of the autopsy: the furrow starts from the anterior part of the neck, above the larynx passing through the side, and rising superficially and coming together on the occipital part of the head. In the anterior part, the furrow was one cm wide, in the sides it was 0.5 cm wide. In the internal organs, a part from pulmonary edema, there were no macroscopic pathologic findings. In the autopsy examination of the neck, there was an strip like ecchymosis around under the furrow area; there was a separation of neck tissue above the epiglottis and between larynx and hyoid bone; there was amussad sign in right arteria carotis communis, left arteria carotis interna and externa; C1-C2 total dislocation, C2 dens axis avulsion and a hangman fracture; and a hemorrhagic fracture in the hyoid bone and thyroid cartilage. When the medulla spinalis was open, there was an observed subdural hemorrhage through out the cervical canal.

Hanging, Asphyxia, Death

417 Aspiration Deaths Among Adults in Istanbul

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Massive aspiration of food is rare, but most common in people under the influence of alcohol or a drug and comatose patients who have impaired functioning of the central nervous system. The finding of small amounts of food material in the airway at autopsy does not indicate the true vital aspiration because of agonal or even early post-mortem overflows. Occlusion of the small airways, mainly the membranous and respiratory bronchioles, partial or total filling of bronchiolar lumen and the alveolar spaces with food or gastric content were typical morphologic findings.

In our 10 year retrospective study we presented the data of 21 male and 4 female cases with a final diagnosis of fatal aspiration in age from 23 to 78 years (45.43±14.61) from the records of Morgue Specialization Department of the Council of Forensic Medicine. 13 cases found death at the scene without an eyewitness. All deaths were accidental in manner except one homicide. Toxicological analysis revealed blood alcohol concentration levels between 161 and 339 mg/dl in 7 cases. Morphine metabolites, benzodiazepine and barbituric acid derivatives, toluene and acetone were detected in 5 subjects. Aspirated materials were food in 14 cases, chewing gum in 3 cases, gastric content in 7 cases and a fabric gag in one case.

The history, other evidence of external vomit on the clothing or immediate surroundings and toxicological analysis are by no means as significant as autopsy findings especially in cases of aspiration.

Aspiration, Death, Autopsy

424 Radiological Imaging of Arteries and Veins at the Autopsy

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Post mortem angiography, although in use for a very long time in medico-legal autopsies, has almost never been applied in Turkey. The aim of the present study thus is to assess applicability and usefulness of the technique for routine usage and to investigate the materials and procedures involved.

The material comprises 130 corpses referred to The Mortuary Section of the State Institute of Forensic Medicine for autopsy. The arterial and venous systems of the head, neck, chest, abdomen, and extremities were visualized radioscopically after administering a radiopaque material. In total, 1832 digitally taken photographs were transferred to the Electronic Data Processing Unit and were evaluated by radiologists and cardiologists. The radiopaque material used was a barium sulfate suspension for oral use (Radiobarit®). An intravascular injection was performed without pressure control.

The radiopaque material presented distribution in all body regions and in the most distal arterial branches. Due to postmortem thrombus formation, distribution failed to develop in only one case. In all regional and visceral arteries, extravasations due to the impaired integrity of the vascular wall, thrombi, aneurysms, atherosclerotic and ectatic changes as well as anatomic variations could be visualized suitably for radiologic evaluation.

The results of the radiologic assessment compared with autopsy evidence revealed near to complete concordance apart from a few cases where radiologically determined findings of medico-legal relevance could not be verified on autopsy. Thus, post mortem angiography due to its simple applicability should be performed in forensic autopsies in a routine manner.

Angiography, Postmortem, Barium

444 Thymic Hyperplasia: A Rare Forensic Autopsy Case

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Thymic hyperplasia is a very rare condition in adults. There are two kinds: true hyperplasia and follicular hyperplasia. In true hyperplasia, thymus size and weights are more than the normal standard. True thymic hyperplasia cases generally occur under the age of ten and are generally asymptomatic. In some cases there can be dyspnea due to pressure.

One case involved a 16 year old male who didn't feel well. He later died while he was swimming. Standard resuscitation was unsuccessful. External examination of the body was quite normal. The autopsy revealed that the thymus was soft, lobulated, homogeneous, and weighed 260 gr. Histopathological examination of the thymus confirmed true thymic hyperplasia.

A forensic autopsy case of true thymic hyperplasia, which is considered to be a rare condition, will be presented and discussed on the bases of macroscopic and histopathologic findings with a review of the literature.

Thymic Hyperplasia, Autopsy, Pathology

448 Forensic Thanatology and Analysis of Death Cause

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The method of analyzing the cause of death has been well discussed in a previous study, which was based on the ICD of WHO and forensic practices. All causes of death were allocated into the different degrees of contribution according to the different actions in death respectively. The method of analysis has been developed and supplied gradually since 1989. Firstly, the definition of forensic thanatology is much clearer, which includes the term, signs, causes, mechanisms, characters, manners, certificate, and analysis of death. It could be concluded that forensic thanatology should be considered as an important system of theory and knowledge in forensic pathology. Secondly, according to the degree of medical contribution in the death mechanism and its interaction, all factors in relation to death should be classified as either an underlying cause, an immediate cause, an intermediate cause, a contributory cause, an inductive cause, a synergistic cause, a conjoined cause, or an uncorrelated factor with the first four factors being defined in ICD. By the degree, any sort of death cause was allocated correspondingly the ratio percent of "degree of contribution" for the instruction of the trial and compensation. Thirdly, the mechanisms of death were divided into several styles, such as circulatory death, respiratory death, cerebral death, and multi-organic function failures (MOF), which can be well distinguished with cause of death. Finally, classification of nature and manner of death was identified clearly on basis of the social character concerning the sources of the death. The former includes violent death, nonviolent death (natural death) and social death, and the latter includes illness, aging, murder, suicide, disaster, natural death and execution, war, euthanasia, uncertain event, etc.

In conclusion, the analysis of death cause in forensic thanatology will benefit our forensic identification especially in the case with many death causes under the confused and disordered condition. The method of analysis may help us comprehend and discriminate the differences and relations of all causes.

The table named as International Form of Medical Certificate of Cause of Death in ICD had been referred and modified in this article and a unified form about forensic certificate of cause of injury and death has been suggested in order to contribute to the international communication.

Source of support: This work was supported by the National Natural Science Foundation Council of China (No. 30772458).

Forensic Thanatology, Analysis of Death Cause, Mechanism of Death

452 The Comparison of the Signs of Classical Autopsy and Virtopsy in a Case Brought Due to General Body Trauma

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The goal of this study was to determine the cause of death in forensic autopsies by radiological methods. During this study, "virtopsy" is discussed under the headline of "Virtual autopsy". The pathological and the traumatic causes such as traumatic and pathological fractures, lesions in internal organs and great vessels, fatal hemorrhages, soft tissue damages, hemopneumothorax, gas and fat emboli, pneumonia, aspiration of food and blood, cutaneous emphysema, myocardial infarction and the tumors are easily detected by using radiological techniques, such as CT, MRI, MSCT and USG, in a few minutes. However, if the classical autopsy is used, a great deal of time and effort is expended.

A male, 24 years of age, died in a motorbike accident and was sent by the prosecutor for a forensic autopsy. He was examined by using MSCT then he was sent for the forensic autopsy. After that, the results of both procedures (MSCT pictures and classical autopsy) were discussed by telephone call before the classical autopsy was finished.

The radiological findings were evaluated during the autopsy and the radiologists discussed the findings of autopsy. The findings of radiological examination were found to be almost the same as those found in the classical autopsy.

As a result, it is concluded that the use of radiological techniques in forensic autopsies is a very positive effort for the future of scientific developments.

Autopsy, Virtopsy, Trauma

455 Cardiac Tamponade: Hemopericardium-Related Fatalities in Istanbul, Turkey

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Bleeding into the pericardial sac may occur from the surface or the cavities of the heart, or from the intrapericardial segments of the roots of great vessels, particularly the aorta and pulmonary artery. In most cases, the cause of hemopericardium is a natural disease, such as a ruptured myocardial infarct or a ruptured dissecting aneurysm of the aorta, but it is also a sequel to the trauma to the chest. In these trauma cases, if the bleeding rate exceeds the drainage rate or a clot closes the defect, a sufficient amount of blood may accumulate in the pericardial sac to cause cardiac tamponade.

In this study, the autopsy records of the Council of Forensic Medicine between the years 2004 and 2006 were analyzed retrospectively and the cardiac tamponade cases were selected. There were 87 male (74.36 %) and 30 female (25.64 %) cases. Of the total 117 cases, the cause of death was natural in 69 (58.97%) and traumatic in 48 (41.01 %). Traumatic causes were stab wounds in 29, firearm wounds in 7, and general body trauma mostly resulting from road traffic accidents in 12 cases. In natural death cases, the source of bleeding was a rupture of the intrapericardial branch of the aorta in 44 cases and a myocardial rupture in 25 cases. In traumatic deaths, myocardial rupture was detected with a frequency of 69 %.

The localization of the myocardial rupture was in the left ventricle in 65.52 % of natural cases whereas the right ventricle was the most affected part of the heart in traumatic cases. The amount of the blood in the pericardial sac ranged between 250 and 1300 cc and the mean was calculated to be 572,05 ml.

The number of wounds in the 36 total perforating trauma cases (stab wounds and gunshot entrance wounds) was 46. Thirty-six of those were detected to reach the target organs. Seventy-nine percent of the perforating trauma wounds that reached the target organs were in the left side of the thorax.

Hemopericardium, Cardiac Tamponade, Autopsy

472 Sudden Death Due to Pilomyxoid Astrocytoma

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Pilomyxoid astrocytomas have been described only recently. They appear as low-grade tumors sharing features similar to pilocytic astrocytomas. However, pilomyxoid astrocytomas have different histological features and behave more aggressively.

Pilomyxoid histology is presently considered to occur in pediatric brain tumors. A 10 year-old girl was brought to a local clinic death after 10 days of analgesic therapy due to a headache that had started two weeks prior. Autopsy findings showed a large, solid enhancing

mass involving cerebellum with an extension to both hemispheres. Histological diagnosis was of a low-grade glioma consistent with pilomyxoid astrocytoma. Pilomyxoid astrocytoma was previously classified within the pilocytic astrocytoma group, but has different histological features and has been shown to be more aggressive than pilocytic astrocytoma. These properties indicate that pilomyxoid astrocytoma may be a different entity that is distinct from pilocytic astrocytoma or it may be an unusual variant. This paper presents and discusses a rare autopsy case of pilomyxoid astrocytoma with the goal of supporting current management of this recently described pediatric low-grade tumor from a medico legal point of view as a reason of sudden death.

Astrocytoma, Tumor, Histology

485 Ectopic Origin of Coronary Artery From the Aortic Wall

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Congenital anomalies of origin and course of the coronary arteries, with or without symptoms, are of special interest for forensic specialists. This paper describes an asymptomatic, but interesting case with ectopic high origin of the left coronary artery. According to the document of death, the patient was found dead on the Coast of Marmara Sea after an accidental drowning while fishing with his friends. The death was considered to be suspicious by the prosecutor and an autopsy was mandated. The case was a 51-year-old cadaver. The decedent was 168 cm tall and weighed 90 kg. There were no specific findings on external examination. Analysis of the organ specimens revealed none of the substances screened for in systematic toxicological methods. Macroscopic examination of both lungs showed edema and congestion. The pericardium appeared normal and the heart weighed 430 g. The ostium of the right coronary artery was hole-like and located in the normal position, but the ostium of the left coronary artery was pocket shaped and located in the left aortic wall of the ascending aorta, 18 mm above the rim of the sinotubular junction. The heart blood supply depended on the ectopic coronary artery. Description of coronary artery pathologies in autopsies is of great importance for explanation of sudden death cases related to ectopic coronary arteries. The aims of this case report are to contribute to a better understanding of the coronary artery anomalies and discuss the pathology of sudden cardiac death from the medico legal aspect.

Ectopic, Coronary, Aorta

488 Intracranial Dermoid Cyst

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Dermoid cyst of the brain is extremely rare. Dermoid cysts are in very low ratio, occurring in one percent of all central nervous system tumors, and usually behave asymptomatic. They are congenital and benign tumors of a very slow enlargement. The male-to-female ratio shows a slight male dominance.

Case presented: A 57 year old male was found dead on the street. The prosecutor considered the case as a medico-legal death since he died on the street and there was no significant cause of death to explain the mechanism.

Upon performing an autopsy of the deceased body, a cyst was found on the brain. The brain weighed 1250gr. There was a papillary tumoral mass, measuring 7x10x10 cm, at the right temporal region located subdural in the brain. Macroscopic evaluation of the brain revealed that the tumor had a dense fibrous capsule. Upon incising the capsule, the tumor was found to contain a yellowish-white paste-like material with 3-4 mm long hairs. The tumor capsule also showed calcifications. The capsule was hardly separated from the surrounding brain tissue.

Histopathological examination of the cyst revealed simple stratified squamous epithelium with fatty cellular debris, a few hair follicles, sebaceous glands and focal calcification. There was also diffuse edema at the surrounding brain tissue. The tumor was diagnosed as a dermoid cyst of the brain.

An Intracranial Dermoid Cyst case will be presented and discussed on the bases of macroscopic and histopathologic findings.

Dermoid Cysts, Forensic Pathology, Sudden Death

493 Conventional Histopathological Evaluation for Traumatic Fat Embolism

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Development of fat embolism after trauma, just as in the clinical follow up, should also be evaluated during postmortem examination. A fat embolism found at autopsy should be examined histopathologically to see if there is any causality between this finding and trauma.

In this study, autopsy reports and histopathological specimens from 196 cases of death caused by traffic accidents of which post-mortems had been carried out by the Mortuary Department of the Council of Forensic Medicine were examined. The relation with the extent of fat emboli and age, gender, trauma score, survival period after trauma, classification of bone fracture locations, and presence of cardiopulmonary resuscitation were searched and statistically evaluated with chi-square and spearman correlation tests. Injury Severity Scales (ISS) and Abbreviated Injury Scales (AIS) were used to measure the severity of injuries. H&E stained preparations already present were examined for the extent of fat and bone marrow emboli using Scully and Glass Grading System.

Out of the 196 cases evaluated, 111 cases were found to have fat/bone marrow embolisms. Fat embolisms were also detected in the lungs. The evaluation also revealed fat embolisms in 22 cases in the kidney, 10 cases in the brain, and five cases in the liver in different levels. Most frequent fat embolism levels were Grade II (45%) in lungs, Grade III (36%) in kidneys, Grade I (90%) in brain and Grade I (80%) in liver. Eight-six cases had only isolated pulmonary embolisms.

Sixty percent of the cases which had been found to have bone fracture had fat/bone marrow embolism in different levels while 30% of those without bone fracture had fat embolisms which had prominently serious trauma (AIS: 13 ± 7)

The survival period of patients with fat embolisms have been found to be between 0-60 days with an average of 8 ± 11 days. There is a negative correlation with the severity of trauma and life expectancy ($r: -0.12$, $p > 0.05$).

Internal organs taken for examination of fat embolism in autopsy had to be processed by frozen section. However, in places lacking the capability, the section was examined with haematoxylin-eosine stain, which also provides valuable evidence.

Fat Embolism, Trauma, Postmortem

510 Accidental Death Due to Paint Thinner Ingestion

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Thinner is an evaporating substance used in various paints. The chemical brand name used in this instance is Recordsol Paint Thinner, which also has toluene and benzene as chemical substances in it and is used in painting with the purpose of thinning paints. Thinner may irritate eyes and skin upon contact. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, and reddening. Ingestion can cause a burning sensation, vomiting, drowsiness, and in severe cases, pulmonary edema. Inhalation of excessive amounts may result in impairment, such as drowsiness, lack of coordination, headache, and nausea. Misuse of this substance is especially high among the teenagers because of its stimulating neurogenic effect.

The case presented is an 18 month old infant girl. She had ingested the thinner by drinking from a water bottle with an unknown amount. She was taken to the emergency room of a hospital immediately, but resuscitation was unsuccessful.

External examination of the body was quite normal. Autopsy examination had revealed no abnormalities. Histopathological examination of the lung showed diffuse congestion, edema, and moderate hemorrhage. There were no remarkable changes within the other organs. Toxicological analyses of the blood revealed 5.33 mg/dlt toluene and 3.16 mg/dlt benzene had been ingested. This presentation discusses and tries to reveal the findings of this accidental case of thinner ingestion.

It is the goal of the researchers to evaluate the pathologic mechanisms of thinner intoxications and the neglects of children in the region of Turkey.

Paint Thinner, Toxicology, Accidental Deaths

514 Fatal Cranial Shot by Blank Cartridge Gun: Two Suicide Cases

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Blank firing pistols are generally considered to be harmless and these guns are not accepted as being firearms in most countries. Due to the lack of legal regulations, these guns are easily purchased by anyone over 18 years of age. Reports of serious injuries and even fatalities due to these guns are increasing in the literature.

These guns, when modified or even unmodified, can cause serious and potentially fatal injuries. Without doing any changes to the barrel, using blank or tear gas cartridges, firing at contact range can cause penetration of gas into the body, including bone.

Two suicide cases are reported in this study. The decedents shot themselves in the temporal region with a blank cartridge gun at contact

range. There were no foreign bodies detected during the radiological examination and a trajectory of a bullet was not found inside the brain. In both cases, the wound was at the right temporal region and there was a defect at the temporal bone with circular soot around the defect. The injury of the brain tissue was localized at the level of the defect, but there was widespread subarachnoidal bleeding. The potential danger of these guns is discussed along with the need for legal regulations concerning these guns.

Blank Cartridge Gun, Suicide, Autopsy

547 Immunohistochemical Study for Postmortem Diagnosis of Early Myocardial Infarction

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Introduction: The postmortem diagnosis of early myocardial infarction has been a puzzling problem in the forensic practice. In those cases where sudden deaths occur in the very early stage of infarction, myocardial lesions cannot be detected easily. Many morphological, histochemical and enzyme histochemical, and electron microscopic or immunocytochemical methods have been introduced for postmortem detection of acute myocardial infarction, but many have been shown to be nonspecific, unreliable, or difficult to use in forensic practice. This study aimed to compare some of the important, recently reported markers using the vast autopsy material of the Morgue Department of the Council of Forensic Medicine in Istanbul, and to identify an effective, specific marker for routine application.

Material and Methods: Sixty cases were investigated prospectively in 2005-2006 at the Morgue Department of the Council of Forensic Medicine. The cases were evaluated according to age, gender, history, cardiopulmonary resuscitation, and macroscopic and microscopic findings of the heart. Sections of formalin-fixed paraffin-embedded myocardial samples were submitted to immunohistochemical staining with Troponin I, fibronectin, myoglobine, and desmine. The cases were divided into five main groups. Group I was myocardial infarct by history, medical records and routine autopsy findings (macroscopic and microscopic examination by Hematoxylen-Eosin (HE) staining). Group II was cardiac death by history, clinical findings, and macroscopic examination of the heart (myocardial infarct not determined by microscopic examination by HE staining). Group III was asphyxia leading to possible myocardial damage and changes in related indicators (no pathological findings of the heart in HE examination). Group IV was extensive trauma resulting from the indicator-influencing potential of enzymes released from damaged muscles other than the heart muscle (no pathological finding of the heart in HE examination). Group V was natural death excluding cardiac death and myocardial damage (no pathological finding of the heart in HE examination).

Findings: Group I was considered as definite myocardial infarction (MI); Group II as suspicious MI; Group III, IV, and V as control groups. The ages were ranging between 20 and 72 with a mean of 41.6 ± 11.9 . Forty-five (75%) of the cases were male. Cardiopulmonary resuscitation (CPR) was performed on 13 cases. Comparison of fibronectin, myoglobine, and troponine I staining between Group I, Group II and the control groups revealed significant differences ($p < 0.05$). However, desmine staining showed no meaningful difference ($p > 0.05$).

Conclusion: It seems that troponine I, fibronectin, myoglobine could be used in routine forensic practice.

Myocardial Infarction, Immunohistochemistry, Postmortem Diagnosis

640 Heart Attack After Car Accident

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This goal of this presentation is to study the acute infarct of the myocardium after a transportation accident. An acute infarct of the myocardium is an acute clinical situation that can occur after a transportation accident. In this poster, a clinical case of an acute infarct of the myocardium after a transportation accident is presented. There is difficulty in establishing a relationship between the two events due to challenge of establishing the causal nexus. The heart attack is an acute situation that can occur after a car accident. In this poster, the clinical marriage of the heart attack to post-car accident is explored and discussed.

Heart Attack, Car Accident, Forensic Medicine, Traumatic Post Stress

101 Study of Serial Homicide Cases in Columbia

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The purpose of this study is to highlight the importance of identifying and using forensic psychiatry as a tool for crime scene investigation in serial homicide cases.

Forensic Psychiatry helps detect, understand, and interpret the messages left behind at the crime scene by the perpetrator. Forensic psychiatry is a resource that contributes to the identification and arrest of the perpetrator.

The study describes two well-known serial murder cases that occurred between 1992 and 2003. These two cases are relevant to Forensic Psychiatry and Criminology because they help understand infrequent violent crimes that affect society at large: pedophilic serial homicides.

The study is based on data obtained from cases reported by the Technical Investigation Section (CTI) of the Colombian Attorney General's Office. Personal interviews with the perpetrators were conducted by a forensic psychiatrist, who was a part of the investigative team. The study was conducted using a qualitative design with a narrative and phenomenological strategy.

Luis Alfredo Garavito (LAGC). Child killings started in 1992. The perpetrator's identity was unknown. Teamwork investigation, including a forensic psychiatrist, began in May 1998. Crime scene processing activities helped develop a profile that led to the perpetrator's identification, arrest, and confession in 1999. This criminal traveled extensively throughout both Colombia and Ecuador, where he killed almost 300 children. The perpetrator's profile is consistent with Antisocial Personality Disorder (301.7 DSM VI F 60.2 CI.10).

Manuel Octavio Bermudez (MOBE). Child killings started in 1999. Initially, these homicides were attributed to LAGC. Despite previous experience, the investigative team was only established in December 2002. Crime scene management techniques led to identification, arrest, and confession of MOBE in March 2003. His criminal activities were limited to the state of Valle, where he killed around 22 children. His profile is consistent with Antisocial Personality Disorder (301.7 DSM IV F 60.2 CI. 10)

Serial homicides, Pedophiles, Sex-Related Homicides

6 Towards a Better Understanding of Asian Youth Gangs: A Rising Epidemic Confronting Our Communities

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With the population of Asian and Pacific Islander Americans (API) continuing to rise in the United States, so do their healthcare needs. Unfortunately, not all Asian Americans are as uniformly educated, acculturated, and financially stable, as the myth of the "model minority" would have us suggest. Although adults from many nationality groups between Asian and Pacific Islanders have adapted well to life in the United States, serious problems have emerged among Asian American youth. In particular, youth gang violence in the Asian and Pacific Islander community has dramatically increased in the last few years by nearly 20% nationwide according to the U.S. Department of Justice, Office of Juvenile Justice, and Delinquency Prevention. In Los Angeles County, California alone, there are currently 155 Asian youth gangs, with a total gang membership of over 6,000. In neighboring Orange County, California, gang involvement has reached an all time high with over 65 documented gangs and a membership of 2,000. Demographics show gang member (male and female) age average of 15 with a range of 8-22 years. Even more disturbing is the increase of Asian females involved in gang activity. In Orange County, where the Asian gang population makes up 12%, there are 140 Asian female gang members, up 60% from last year. Other surrounding counties in California and the cities of Philadelphia Pennsylvania, Fairfax County Virginia, and Portland Oregon have seen similar trends in the rise of Asian youth gangs. The author interviewed over 400 gang members out in the streets, jails, and juvenile halls, using a target questionnaire; concomitantly went a step further disguised as a gang member. This study identified a distinct difference between Southeast Asian gangs and Pacific Islander gangs. Southeast Asian gangs were often seen as "non-traditional" gangs by the author, whereas Pacific Islander gangs (i.e.: Filipino, Samoan, and Chamorro) were considered more "traditional." Moreover, the author identified seven contributing factors, which lead to involvement in both male and female Asian gangs (i.e.: substance abuse, lack of adult supervision, breakdown of the family, victimization due to racism, culture shock, need for survival, and monetary profit).

The purpose of this paper is to present timely data on API youth gangs; offer strategies on how to recognize and interpret various tattoos and graffiti associated with these gangs, which could assist the medical examiner/coroner and death investigator in the positive identification of the decedent out in the field and/or in the autopsy room. Most importantly, it is imperative that the medical examiner/coroner community understand the "signs and symptoms" of API gangs in order to keep themselves and those around them safe when investigating the deaths of these gang members.

Youth Gangs, Asian American, Youth Violence

184 Standard Assessment of Criminal Responsibility in the Mentally Disordered Offenders in China

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In China, criminal responsibility is divided into three types or grades; whole responsibility, diminished responsibility, and irresponsibility. According to the Criminal Law, "If a mental patient causes harmful consequences at a time when he is unable to recognize or control his own conduct, upon verification and confirmation through legal procedure, he shall not bear criminal responsibility." That means there are two standards of assessing criminal responsibility, namely volitional and cognitive capacity. It is as equal to the *Mc Naughton Rule* or the *Irresistible Impulse Test*. However, for a long time, the criminal responsibility was assessed only by experience, and lack of a standardized assessment tool. Recently, the Institute of Forensic Science in China developed "the rating scale of criminal responsibility in mentally disordered offenders." The "scale" consists of eighteen items: motivation of crime, aura before offence, inducement of crime, time selectivity of crime, place selectivity of crime, object selectivity of crime, tool selectivity of crime, emotion during the crime, shirking responsibility after offence, concealing the truth during the inquest, camouflage, understanding the nature of the behavior, estimating the consequence of the offence, impairment of life ability, impairment of the capacity of study or work, impairment of insight, impairment of reality testing, and impairment of self-control. This scale is not limited to specific criminal behaviors and cases or symptoms and diagnoses of mental disorder, but is applicable to all criminal cases which need to assess responsibility. It is convenient and easy to master.

The scale has been tried out in several organizations. The Cronbach α of the whole scale is 0.9322 and all items have high correlation with the total score of the scale ($r=0.157 \sim 0.904$). Three factors were extracted by the factor analysis and their cumulative squared loading equals 68.62%. The scores of the three grades were (9.66 ± 5.11) , (26.54 ± 5.21) , and (40.08 ± 7.90) respectively. By establishing three discriminants, classification results suggested that 94% of original grouped cases were correctly classified and have high conformity with the experts conclusion.

Criminal Responsibility, Rating Scale, Mentally Disordered Offender

183 Civil Competence Assessment of the Mentally Disordered Involved Contract Dispute

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The objective of this research is to find and ascertain the items that can be used as indicators of civil competence assessment when the interviewee was involved in a contract dispute. The data related the interviewee's mental status and the forensic expertise were collected retrospectively. The six items identified and graded were awareness of the situation, factual understanding of the issues, appreciation of the likely consequences, rational manipulation of information, functioning in one's own environment, and communication of a choice. All the data were analyzed by means of SPSS. Results: Of the 56 cases included in this study, the expert's opinion of the interviewee's civil competence was graded into three parts: full civil competence, diminished civil competence, and no civil competence were graded 10, 21, and 25 respectively. Schizophrenia, among other psychotic disorders, was graded highest with 25 cases. Organic mental disorders were rated second with 14 cases. The cases were divided into two main type contracts: the real estate related contract and the labor related contract. All the six items was related to civil competence with the related coefficient from 0.703 to 0.817. The interrelated coefficient of the six items was also high, from 0.721 to 0.865. The researchers concluded it is feasible that civil competence of the mentally disordered was divided into three grades. The documented six items can be used as the good indicators of the civil competence.

Mental Disorder, Civil Competence, Contract

250 Ninety-One Case Follow-Up Study of Mental Injury Compensation Suits

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This research will present the results of mental injury compensation suits and analyze the influence of forensic expert witness reports and other related factors. Ninety-one cases from March 2003 to June 2007 were collected and mono factor testing and multiple correlations were used. Researchers determined there was no significant difference in compensation for medical related expenses between endogenous mental disorder groups and stress related mental disorder groups whereas a significant difference existed in compensation for mental injury. Both compensation for medical costs and mental injury are correlated with living in cities, long-term psychiatric hospitalization, and being accompanied by serious physical disability. Judges can use flexible discretion to determine the compensation for medical related costs and compensation for mental injury which are closely related to the type of mental disorder. The compensation for mental injury in rural populations was found to be insufficient.

Compensation, Mental injury, Forensic Psychiatric Expertise

474 Sociodemographic and Criminological Assessment of Multiple Homicide Perpetrators

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The aim of this study was to evaluate the sociodemographic and criminological features of multiple homicide cases. This study has been performed as prospective, cross-sectional, and descriptive. Twenty-two cases of individuals that committed two or more murders in the same case have been included in our study. All were cases that were referred to the Council of Forensic Medicine, 4th Specialty Committee by judicial courts between the dates of April 2006 and February 2007. Each case was submitted to determine the perpetrator's criminal liability for the committed crime. The features of the perpetrators such as age, gender, marital status, occupation, education, criminal history, and medical antecedents were determined through the use of a semi-structured questionnaire. Results: Twenty-one (95.5%) of the 22 cases of multiple homicide perpetrators were males and one (4,5%) was a female. The distribution of the ages was 35.77 ± 10.43 . According to their educational levels, two (9.1%) were uneducated, 15 (68.2%) finished elementary school, one (4.5%) graduated from high school and four (18.2%) graduated from a university. As for the victims, five (22.7%) were first-degree relatives, four (18.2%) were friends and/or neighbors, two (9.1%) were spouses and/or spouses' relatives and 11(50%) were strangers. In the psychiatric evaluation, the results have shown that 17 of the perpetrators (77.2%) had criminal liabilities and five (22.6%) had psychiatric problems of a level that negated their criminal liabilities. In the evaluation of the criminal antecedent of the cases, the results have shown that 15 (68.2%) of the perpetrators had committed different crimes before. Discussion: Since multiple murders are rare cases and there are a limited number of prospective studies regarding this subject, this is presented as a preliminary study. In the study, it was significant that most of the cases were from the family or entourage of the perpetrator, the level of education of the offenders was low, and their criminal antecedents were excessive.

Multiple Homicides, Forensic Psychiatry, Criminal Liability

475 The Investigation of Depression Scale Points of Sentenced or Imprisoned Adults in an M-Type Jail in Ceyhan, Turkey

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The aim of this study was to evaluate the depression scale points of sentenced or imprisoned adults in jail, considering certain variables. The study is also designed to address many questions. Firstly, are there significant differences between depression points and the kind of class or reason for detention (being sentenced, prisoner or sentenced-prisoner)? Secondly, are there significant differences between depression scale points and the kind of crime? Thirdly, are there significant differences between depression points and communication with family (open visiting, closed visiting)? Fourthly, are there significant differences between depression points and the number of prisoners in custody?

This study utilized the survey method. A working group was formed by chance from 100 sentenced, imprisoned and sentenced-prisoner adults in an M-type jail in Ceyhan, Turkey. Personal Knowledge Forms and a standard Beck Depression Inventory were used for the collection of the data and Standard PSS 10.0 was used for the analysis. One-way analysis of variance (one-way ANOVA) was carried out for each independent group.

According to the results of the analysis, a significant difference was found between the kind of execution of the sentence and the depression scale points. [$F(2-97) = 3.23, p < .05$]. The Scheffe test was used to find which group caused the difference between the kinds of sentence execution. The depression point of sentenced individuals ($X=18.68$) was higher than sentenced-prisoners. The depression points were not significantly different between the kind of crime [$F(5-94) = 1.17, p > .05$]. Based on the type of crime committed, the mean depression scale points of prisoner awaiting judicial decisions and sentenced-prisoners were as follows: robbery, $X=21.67$; usurpation, $X=20.54$; injury, $X=16.50$; homicide, $X=15.74$; sexual crimes, $X=17.33$; and for other crimes, $X=12.10$. The One-way ANOVA Test was used to find if there was a significant difference between the depression scale points and communication with family. The research showed the existence of a difference: [$F(1-98)=3.76, p < .05$]. The depression scale points of individuals who were allowed open visitation ($X=15.70$) were lower than individuals who were only allowed closed visitations ($X=21.21$). A significant difference did not exist between depression scale points and the number of individuals in custody [$F(2-97) = .11, p > .05$]. The results of this study are discussed with the current literature.

Depression Scale Point, Sentenced, Prisoner

692 National Footwear Training in the United Kingdom

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One thing is certain – criminals do not hover in and out of crime scenes, they leave shoe marks somewhere. The trick is to find them and then importantly, understand what to do with them.

The use of footwear as an intelligence and evidential tool in the investigation of crime has not been maximized to its full potential in the United Kingdom over recent years. Footwear evidence has always been within the remit of the forensic science providers and the commercialization of forensic services in the United Kingdom has required forces to review the position of buying in services or bringing them in house.

This has seen the formulation of a national body under the direction of the England and Wales Association of Chief Police Officers (ACPO) to advise on best practice in the use of footwear. The National Footwear Board was set up in 2007, chaired by a senior police officer, and made up of regional representation from forces across the United Kingdom including Scotland and Northern Ireland.

The remit for the Board includes operational guidance, legislative issues, future developments, the development of national standards, and a nationally recognized and accredited training program for those staff involved in the use of footwear, from basic coding through to the provision of expert evidence in court.

The National Policing Improvement Agency (NPIA) is a United Kingdom Government Agency set up in April 2007 to provide support and guidance to United Kingdom policing. An element of this support is the provision of national training program, either devolved to forces, or delivered by NPIA for specialist high impact training.

The NPIA Forensic Centre based at Harperley Hall, Durham provides specialist forensic training and has been tasked with the development of a national footwear program that suits the requirements of the United Kingdom police service and provides the ability to bring all footwear related areas in house for those forces who choose to do so. There is a clear business case for this to happen when the basic analysis costs for a footwear comparison is quite expensive.

The program has been developed in conjunction with forces and environmental scanning to establish some form of benchmark to work from. It was clear in the early stages of this work that there was little in the United Kingdom to support this, and the closest model that provided the reassurance required was in use in the Netherlands.

The program consists of the following important elements:

- Pre course learning
- Assessment in the workplace
- Formal training interventions
- Nationally agreed standards
- Common assessment

Footwear, Training, National

597 A New Model of Teaching Forensic Science at Universities

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The paper shows authors' experience in creating and functioning the Center for Forensic Science at Warsaw University, Warsaw (Poland), which has been established in cooperation of four faculties: biology, chemistry, physics, and law. The aim of the Centre is to provide knowledge to master and postgraduate level students and to prepare forensic expertise for criminal and civil proceedings.

The project of the study has been accepted and submitted by the National Training Centre for the Officials of the Common Courts of Law and the Public Prosecutor's Office (of the Polish Ministry of Justice). This is the first in Poland postgraduate study in forensic science for prosecutors.

The authors will share their experience in developing such a project, how to teach the practicing lawyers forensic science, and what theoretical and practical problems they deal with.

Education, University, Practicing Lawyers

341 Applied Research on the Teaching Method of PBL in Forensic Pathology

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Problem-Based Learning (PBL) is a new teaching method different from the traditional teaching methods and is widely used in the teaching of basic medicine and clinical medicine. It was generally ignored but used in forensic pathology in China. As the different systems of forensic medicine and education between the western countries and China, PBL teaching has broad prospect in Chinese professional teaching of forensic pathology. However, there are no reports on how effective PBL teaching is and what percentage of the forensic pathology teaching calendar should be dedicated to it. Therefore, the author chose a common and important special topic, "the

relationship between injury and disease,” and conducted PBL teaching for 95 undergraduates of two classes in the grades of 2002 and 2003 in last two school years.

First, the instructor selected special topics, typical medicolegal cases, and wrote the teaching plan. The instructor then briefly introduced the PBL method and the teaching plan to the students, and divided them into seven groups, with six to seven students in each group. During the first stage of the PBL teaching, students were allowed to read the literature on the special topic from the library and on-line, ask questions, and discuss in groups. The instructor then collected and compiled all student questions and returned the questions to the students and let them read the literature and discuss in groups again.

During the second stage, the instructor gave a lecture on the special topic of “the relationship between the injury and disease” and offered a typical case with relative discussion topics on the case. The students were then allowed to review, prepare, and discuss outside class once more.

During the third stage, instructor and students together discussed the case in the classroom. The students first discussed the pathological diagnosis and expertise conclusions of the typical case freely. Then the teacher provided answers and final summary. The PBL teaching method was a cooperative effort by individuals, groups, and instructor and the study papers were written by students and the instructor. Most students agree that this method is most rewarding and they learned a great deal through the PBL teaching method. The method helps to train the students’ ability to analyze and solve problems and to enhance both the comprehensive and teaching quality.

Education of Forensic Medicine, PBL Teaching, Teaching Method

182 Implementation of a Country Forensic Education Structure as a Foundation for Harmonizing Forensic Procedures at the National Level

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Brazil is experiencing an unheard of moment in its History. Recent events leading to Federal Police and Federal Public Ministry operations and investigations have yielded a favorable atmosphere for debate general dissemination of the importance of forensic and evidential analysis in the Country - the well known main catalyst of the national crime and corruption being impunity. Only with robust evidence will it be possible to accuse, indict, try, and convict criminals as expected by Brazilian society within the principles of a Democratic State of Law.

Nevertheless, at present, the public forensic and investigative organizations act in independently, each one with its method and knowledge sharing is scarce. The criminal analyst’s professional activity is minimally acknowledged as such.

In Brazil, law enforcement agencies, with few exceptions, ignore criminal analysis methods and techniques. They frequently use intuition to obtain satisfactory results instead of sound forensics intelligence analysis which the many types and stages of law enforcement should utilize in harmony. Meanwhile, in the United States, the National Criminal Intelligence Sharing Plan recommends that all law enforcement institutions adopt a minimum standardization framework to develop high-quality analytical professional products.

The presenter has summoned all Brazilian law enforcement personnel to participate in the great project of enriching, updating, and unifying forensic intelligence analysis methods. Brazilian servants’ of law-enforcement class associations decided to unite their twenty thousand-strong active agents with the goal of generating a University-level Crime-Analysis educational structure as a new career and with that, to generate a dynamic structure of technical cooperation among all the organizations involved in Law Enforcement in the Country to guide the studies and research in the area.

The main entity created to meet this challenge is CIPAE – Comunidade de Inteligência Policial e de Análise Evidencial (Community for Policing and Evidence Analysis Intelligence). The CIPAE is a civil organization formed to host the majority of public servants acting in Law Enforcement.

Such an organization also stimulates the technical cooperation and the exchange among Brazilian and foreign entities besides emitting technical and scientific recommendations concerning areas of intelligence in evidence analysis.

Another mission of the CIPAE is formulating and proposing changes in the effective legal system of Brazil, regarding the area of Law Enforcement Intelligence, with the presentation of Law projects to be converted into legislative debate and enforced to the benefit of the whole of Brazilian society. The process in responding to this pioneering challenge happening in Brazil can be looked upon as a successful

Topics to be covered:

1. Country Crime Situation
2. Country Solutions
3. Country Forensic-based Investigation and Intelligence
4. State of Forensic Science and Techniques
5. An Educational Approach to Implementation of Doctrine and Forensic-based Intelligence Practice
6. Actions Responding to Country situation - CIPAE
7. Federal University and Private Universities Partnership
8. Partnerships with Foreign Educational / Training Institutions
9. Operations of Dissemination of Knowledge and of Techniques
10. Present evaluation of Results and the Future

CIPAE, Analysis, Intelligence

723 Introducing ASCLD Consulting

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This poster presentation is designed to introduce ASCLD Consulting, a newly established US based business venture created by ASCLD and Quenpro Inc., to the IAFS attendees and to outline the range of services available to laboratories seeking accreditation by ASCLD/LAB-International.

The poster materials are organized to provide the following information:

- a) The management team and its overall responsibilities
- b) The operational component of the company including services offered to potential customers for system implementation, training and audit.
- c) The poster highlighting the services available from ASCLD Consulting and outlining future targets and events of interest to laboratory directors.

These materials will also provide information on the commercial nature of ASCLD Consulting and its vision of fostering appropriate liaisons with other stakeholders and established commercial suppliers of specialist services where required to achieve the highest level of customer satisfaction.

ASCLD, Laboratory Accreditation, Laboratory Directors

244 Scientifically Flawed Forensic Opinions: A Systemic Solution to an Enduring Problem

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Forensic science is so diverse that problems seriously afflicting some of its practitioners can be completely unfamiliar to others. Nevertheless, expert testimony of any type, especially when revealed to have been the source of a miscarriage of justice afflicts all forensic scientists. Though narrower in its aim than suggested by its title "Forensic Science: Oxymoron?" that 2003 editorial in North America's leading scientific journal was painful to all in the forensic enterprise. And it should have been, since part of that enterprise is plainly vulnerable to legitimate scientific criticism. Scientists accustomed to scientific work being published in refereed journals and otherwise openly vetted can view with disdain written opinions, supposedly scientific, that are not exposed to objective review, but are at times part of a "hide-the-ball" legal strategy. Specific remarks about the problem are limited to forensic engineering science. However, the suggested solution should apply to a wide segment of forensic science, even if not to the entirety.

Practitioners in forensic engineering science very often are engaged by the attorney of a party to a criminal or civil dispute. The litigation strategy of the attorney rests in large part on the opinion of the expert and how well that opinion may be received in court. Although the United States and other countries require a pretrial written statement of an expert witness's conclusions and the bases for them, attorneys regularly pressure "their" forensic experts to limit what they put in writing so as not to provide "ammunition" for the adverse party. This is one of the sources of inadequacy in pre-trial reports, many of which would be discarded immediately in a traditional scientific arena. Some are flawed because they fail to identify the evidence supporting their conclusions. Others fail to develop a logical connection between the evidence and the conclusions. Yet others, bordering on dishonesty, fail to recognize evidence that weakens or even is fatal to their conclusions, though it indisputably exists. In the extreme cases, the flawed reports violate the laws of physics, logic, or probability. For those who view forensic science as *science* and not as window dressing for lawyerly arguments, such writings can be frustrating. This frustration arises because at present there is little that can be done to counter the harm such reports do. Many lawyers nevertheless hold that there is no problem, as the adversarial system with its provision for cross-examination can root out faulty science and faulty reasoning. Others defending the status quo say that professional organizations and licensing agencies deter abuses by punishing those who prostitute their professions through what they do as expert witnesses. As to the value of the adversarial system in rooting out anything, the United States Supreme Court has already addressed the weakness of that argument in *Daubert* and progeny, wherein it took the first steps to relieve the lay jury from having to play the role of a dissertation committee. As to the threat of sanctions as deterrence, anyone who has filed a complaint with a professional organization or licensing agency has learned of the repugnance with which such bodies view being asked to judge the substance of testimony by one of their members. They are always ready to render judgment on an engineer or scientist who lied on a CV. However, when told that someone over whom they have jurisdiction has violated the laws of physics, the laws of probability, or the rules of logic, these bodies respond that they cannot "retry the case."

In order to reduce the harm done to the justice system and forensic science, seriously flawed opinions must be identified as such very early in litigation. This can be done by relatively minor amendments in the rules of procedure, starting by making more explicit the description of the required expert reports. Specifically, forensic reports should be required to obey the rules of traditional scientific and engineering writing in that their conclusions must be supported by the evidence and by logic and that they should provide a full account of the event being analyzed. These reports would be required to be provided to the adverse party earlier in the process than is currently the case, and they would be provided *intact*. Moreover, any party would have the right to demand a *peer review of a report* submitted by an adverse party. This presentation will describe the practical aspects of the proposed peer review for forensic reports and will address the objections expected to be raised to the proposal.

Ethics, Peer-Review, Procedure

133 "Transplant Tourism:" The Indian Perspective of an International Pandemic

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Advances in the medical field have enabled the use of several organs for transplant purposes. Harvesting / retrieval of organs from the Non Heart- Beating Donors (NHBDs) is the most common method for procuring organs like eyes, kidneys, liver, pancreas, intestines, lungs, heart. However, of all these organs, kidneys are the most commonly transplanted organs as they are the ones that can be procured even from the living.

Since a person can survive with a single kidney, people in the underdeveloped and developing countries are usually lured into selling them to a wealthy recipient, usually from the oil rich Middle-East Countries or the West. This has led to a newer concept in the tourism world- "Transplant Tourism." Plane loads of wealthy recipients come to preplanned destinations for the purpose of transplantation so as to circumvent the legal formalities in their respective countries of origin and as also to jump the ever increasing "waiting list." Lax or non-existent rules regulating organ donation, corrupt officials and doctors, good infrastructure, abundant supply of willing or unsuspecting donors and poverty, all came into play to popularize this concept.

Egypt, Philippines, India, China, and Pakistan are some of the countries where this trade flourishes.

In the recent past, India had become a hot bed for transplant surgeries for the people from 'affluent' and 'developed' countries. The Amritsar scandal, Bombay, Bangalore, and Tamilnadu scandals are still fresh in the minds of the Indians. Recently, police raids in various private hospitals in and around Chennai and Madurai of the state of Tamilnadu, unearthed a kidney scam worth up to \$25 million. Most of the so called donors were the hapless tsunami victims and their relatives who were promised up to \$3,000 by the middlemen, but were eventually paid only \$1,000.

This article discusses the various aspects of this menace including the medico-legal implications, in India and South East Asia, stresses the need to increase the organ harvesting in the present day paucity of donors and suggests possible ways to cure this pandemic.

Transplant Tourism, Organ Transplantation, Medico-Legal Implications

691 Damned if You Do, Damned if You Don't

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Recent criticism has been raised about the presentation of expert scientific evidence in court. Should the expert who forms an opinion, which is subject to a qualification, disclose this qualification irrespective of being requested by the lawyer calling this evidence. If this qualification is not disclosed, then the opinion is not entirely accurate and from a scientific viewpoint should not be expressed. This has raised ethical issues as to whom the expert owes a duty. Scientific evidence has become increasingly complex and the trier of fact (judge or jury) may not have the knowledge or the capacity to evaluate this evidence. Hence, the expert witness must provide an impartial opinion to assist the trier of fact with the criteria for evaluation. Does the expert owe a duty to the court or to the party paying for their service? There appears to be a seemingly irreconcilable tension between the demands of science and law in this circumstance. The expert may interfere with the fundamental basis of the adversarial system when the expert volunteers evidence during a trial instead of answering questions put to them. A verbose witness may also confuse the jury, especially if he or she does not know what has already been disclosed to the jury and may blur the edges as to who decides the issues at hand. It is time to debate whether justice is about truth and whether law is about justice! How far must an expert go when the counsel for the opposing parties are not sufficiently acquainted with forensic evidence to provide competent cross-examination?

Evidence, Expert Witness, Duty

569 Electron Microscope (SEM Analysis) in Medical Malpractice Cases

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The Statute on Socialization of Health Services which came into force on January 5, 1961 says, "Medical services are the activities done in order to get rid of the factors that are harmful to health, prevention of the public from these factors, treatment of ill people, rehabilitation of the disabled."

A physician, hospital, or other provider of health care's deviation from the applicable standard of care is referred to as medical negligence or medical malpractice. As with general negligence, it describes conduct that deviates from a reasonable standard of care.

The Council of Forensic Medicine is the official expert for judges and prosecutors in Turkey. After the Statute on the Council of Forensic Medicine came into force, the third Specialty Board started to deal with the malpractice cases.

In this study, three cases which were sent from the judges to the third Specialty Board were presented. In these cases the cause of litigation was the plates which were used during neurosurgical and orthopedic operations and were broken after surgery. Using SEM analysis, we detected if the plates were manufactured appropriately or not. If they were manufactured appropriately, we decided if the operation was completed according to the surgical rules.

Forensic, Malpractice, SEM Analysis

383 The Statistic of the Legislation on Brain Death in Ethnics

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The authoritative traditional notion of death has been challenged when it comes to defining the exact time of death. Therefore, the notion of brain death emerged. The crucial problem is to have a statute or rule to make known that once brain death has been confirmed, a patient may be treated as dead. Emergency treatment can be discontinued or organs can be taken out to be used in transplantation, regardless of heartbeat, breathing maintained by man-made techniques, blood, flesh, and temperature. This is so-called "legislation on brain death." Surely, the diagnosis standard on brain death cannot be named on the same day that the legislation on brain death is passed. The former refers to the norms guiding concrete medical practice, which function to avoid making a wrong diagnosis, while the latter is to "prescribe" legally that those can be treated as corpses once their brain death has been verified according to the diagnosis standard.

All the nations hold that dealing with brain death must be predicated on self-determination of a person's right of existence. Doctors must respect patients' choices. If a patient is incapable of making a choice, a legal guardian can choose. The future law on brain death should not deviate from this kernel of modern ethics of medical science. Lawmakers should take into consideration whether the public in today's China can accept legislation on brain death. The author conducted research in order to illustrate some problems involved in the Chinese public's acceptance of legislation of brain death.

Considering whether brain death should be taken as one of the standards of judging death in China, the people in the adult group have given energetic support. This shows the broad prospects of China's legislating on brain death in several years. The people engaging in medial affairs have the highest rate of approval of 96.9 percent, which shows that Chinese medical staff can take vigorous action to carry it out once a law on brain death is enacted.

The question is considered of whether to legislate on brain death in China now or one day in the future when the traditional idea will leave only faint memories in Chinese mind and they can accept advanced technologies. Seniors are more prone to the immediate legislation on brain death than juniors, who prefer later legislation. The analysis exhibits the fact that the legislation on brain death may more affect the immediate interests of seniors than interests of juniors because of their relatively low death rate.

More than half the Chinese population seems able to accept the idea that patients that are brain dead should be considered dead. However, they are not completely at ease with this proposition. While it becomes easier for many to accept once legislation has been passed on the status of those who are brain dead, this does not correlate with the ability of relatives to decide to donate their loved ones' organs when there is no will; especially while the loved one is still living. Many in China think that it is a violation of the deceased person's wishes and that the public will condemn the decision to donate their organs. In these matters, tradition has served to give the Chinese a sense of rootedness. There is still much to accomplish before the Chinese will be able to donate their brain dead relatives' organs, when there is no such specification in a will, so that people waiting for organ transplantation can be served.

Brain Death, Ethnics, Legislation

Mass Disaster Victim Identification

624 Management of Dead in Mass Disasters – South Asian Perspectives

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Management of the dead has become an issue of serious concern in the management of mass disasters in the past two decades. Though natural and manmade disasters of large magnitude are not unfamiliar to south Asian countries there is no current collective vision or standard strategy related to the management of mass fatalities when such a disaster occurs. Therefore the net outcome pertaining to establishing identity, cause of death, and disposal of the deceased were markedly sub threshold. However with the recent frequent occurrence of major disasters many countries in the south Asian region have realized the importance of disaster victim identification (DVI). These countries have set up DVI centers and have adopted DVI protocols modified to meet local conditions.

Yet much has to be done to elevate the standards of DVI especially with regard to setting up transport and temporary storage facilities, identification procedures, documentation methods, and training of necessary personnel. Management of mass fatalities is essentially a multidisciplinary, multistage process which requires extensive preplanning and immediate activation when required. It is a highly skilled integrated task and a sensitive issue from the angle of public opinion. It needs to be performed with meticulous coordination of the political hierarchy of the affected community. Therefore there needs to be a well-established policy and strategy at the governmental level. A policy geared towards disseminating multi disciplinary services at the bottom level with regard to the management of dead in a disaster situation.

Mass Disaster, Management, Mass Fatalities

240 The Airport 2007

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The occurrence of mass disasters with large numbers of victims requires the cooperation of experts from the forensic sciences, forensic pathology, natural sciences, rescue staff, and state authorities. DVI teams are created in many countries for these purposes. The research project named "The creation of the structure of the team for identification of mass disaster victims (DVI) as the instrument of solution of forensic and medico-legal problems during the identification of persons and things in the cases of mass disaster" was established under the support of the Ministry of Interior. Personnel from the Institute of Criminalistics in Prague, forensic pathologists trained in mass disasters and identification from the Institute of Forensic Medicine and Toxicology of General Teaching Hospital in Prague, and the Military Institute of Forensic Pathology of the Czech Army were charged to complete this project. The project has two main goals:

- 1) The creation of an organizational model of the DVI team and methods of operation in the case of mass disasters in Czech Republic and training of police staff and forensic pathologists as members of a DVI team.
- 2) The updating of Interpol forms for identification and their translation into the Czech language, and conversion into computer enhanced form. The aim of the second goal is to introduce the standardized operations according to international conventions as well as for eventual cooperation with other countries.

The final version of the project was tested on the exercise "Airport 2007" simulating an air crash accident. The procedures of the scene examination as well as organization and handling with updated computer enhanced PM forms were verified. The presentation describes in details this mock exercise and procedures used for identification.

The presentation was supported by the research project given by the Ministry of Interior of the Czech Republic No VD20062008B07.

Mass Disaster, DVI Team, Identification

30 “You Got My Maggot Upside Down!” Publication From Idea to Market

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Editorial representatives of both book and journal publishing will offer advice on how to navigate this unique world. This is not a pitch for a specific publisher, but an information session that will educate authors and potential authors.

Attendees will learn the elements of a good book proposal, the questions to ask a prospective publisher before deciding to publish with them, and the answers that indicate a promising relationship. The editors will walk the attendees through the standard industry book-publishing process from the first query, through manuscript submission and publication production, to the marketing of the final product and publication of subsequent editions. All questions will be answered, and the editors will advise on any new ideas.

Faculty and attendees will also explore the issues to consider when deciding where to submit journal articles—from Impact Factors and readership levels to copyright policies, rapid publication options, and Open Access. Learn what to expect after an article is submitted and how to handle problems in the review or publication process. Proposing new journals and finding the right publisher for an existing journal will also be briefly discussed.

Publishing, Books, Journals

563 Back to Basics – Is the 21st Century Focus on Technology Overshadowing Good Forensic Science?

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Constant technological evolution is one of the main drivers of forensic science. The universal advent of DNA is undoubtedly the ultimate example on how a new technology can literally revolutionise our discipline. However, new technologies not only bring expanded capabilities and opportunities, but also generate many challenges that may take years to be identified. Some examples include: loss of a holistic approach due to ultra-specialisation, apparent slow pace of “high-tech” laboratories, “false comfort zone” where the increased number of sophisticated tests rarely translates into more accurate or useful information, etc.

These challenges are reviewed in this presentation, along with casework examples focusing on criminalistics/trace evidence. It is argued that forensic scientists do not need to have the latest sophisticated resources to achieve meaningful forensic science. To be successful, technological developments must occur with prime consideration of the forensic context (holistic forensic approach, fit for purpose, etc). The focus should be shifted back on science as opposed to technology. In parallel, the future of forensic science is more in the hand of crime scene investigators. The successful marriage of modern onsite technology with fundamental forensic science principles and novel intelligence approaches applied early in the investigative process will ultimately allow forensic science to reach new levels not achieved so far.

Forensic Science Principles, Technologies, Value of Forensic Science

695 Applications of Mobile GC/MS and Hand-Held Air Sampling in Forensic Analysis

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Laboratory analyses provide the forensic scientist with a wide array of analytical capabilities, but at the expense of time, money, and potentially lost information. On-site analysis, on the other hand, must utilize either highly specific analyses, or non-selective, low-fidelity techniques. This can result in limited information or highly suspect data. This research is aimed at bringing the power of a laboratory technique, gas chromatography/mass spectrometry (GC/MS) to the field for on-site data collection, utilizing a variety of integrated gas- and liquid- phase sample introduction techniques to maximize the analytical flexibility of the technology. Data for the detection and quantification of illicit drugs, chemical warfare agent simulants, explosives, pesticides, and other VOC and SVOC analytes will be presented.

A mobile GC/MS system, the Griffin 450™, based on a low-thermal-mass (LTM) GC and a cylindrical ion trap (CIT) mass analyzer, was used for all work reported here. This small-sized instrument was ruggedized for field deployment in mobile labs. The instrument allowed liquid injection onto the GC via a split/splitless injector, and gas-phase sampling onto either a chemical sorbent tube or a sample loop. A hand-held sampling and thermal desorption device, the Griffin X-Sorber™, was also used for sample collection in the field to extend the reach of the mobile GC/MS. Method development and instrument calibration before field deployment was achieved via analytical standards that were prepared in solution for liquid analyses, or in Tedlar bags for gas-phase analyses.

GC/MS data for a wide range of volatile and semi-volatile analytes, including illicit drugs, explosives, chemical warfare agent simulants, toxic industrial chemicals, pesticides, and compounds from the EPA 8260 (VOCs) and 8270 (SVOCs) methods have been collected using

the equipment described above. Data illustrating the separation ability of the LTM-GC for complex mixtures, the NIST MS library matching capability of the CIT-MS, and the quantitative capability of the instrument will be presented. In general, detection limits for compounds in liquid matrices are in the low parts-per-billion (ppb) range; a specific example that utilized solvent extraction to preconcentrate nitrobenzene contamination from river water showed parts-per-trillion (ppt) detection limits. Gas-phase analyses also typically yield limits of detection in the ppb to ppt range, depending on the time allowed for preconcentration. The typical linear dynamic range of the system is four to five orders-of-magnitude, when utilizing a dynamic ionization control algorithm developed at Griffin.

A rugged, mobile GC/MS with both liquid and gas sampling capability is applied to rapid, on-site forensic analyses.

On-Site Analysis, Compound Identification, Mobile GC/MS

489 Characterization of Chemical Markers of Decomposition for Geoforensics

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Decomposition of mammalian soft tissue is a postmortem process that, depending on environmental conditions and physiological factors, will proceed until complete disintegration of the tissue has occurred [1]. Recent investigations indicate the possibility of utilizing the temporal variation of the chemical markers of decomposition in order to estimate time since death [2-4]. Fatty acids have the potential to show reproducible patterns with respect to time and temperature, thus providing novel chemical methods for estimating postmortem interval. This is reinforced by preliminary results obtained under both Western Australian and southern Canadian (Toronto) conditions using pig carcasses placed on a soil surface [5]. Recent studies have also revealed additional compounds that can be related to the biochemical pathways involved in decomposition [5]. This presentation discusses research into the viability of these fatty acids as forensic indicators of postmortem interval and the identification of additional products of decomposition that may be of forensic importance.

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Decomposition, Chemical Markers, Fatty Acids

116 Forensic Botany: Vegetation Associated With Grave Sites in Southern Ontario

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Forensic botany refers to the application of botanical evidence to a legal investigation. Botanical evidence may be used in forensic investigations to estimate postmortem interval (PMI) of decomposed remains, to link a suspect to a crime scene, and to track distribution of plant-based illicit substances. One of the more common applications of botanical evidence to forensic science is for the identification of clandestine grave locations. The burial of pig carcasses for a decomposition study in southern Ontario provided the opportunity to investigate the botanical species associated with gravesites in this region. This study investigated the differences in vegetation structure and species composition on disturbed gravesites in an environment that was dominated by weed flora. Differences in botanical species between disturbed gravesites and undisturbed areas were identified and highlighted the potential of these species to be used as grave indicators. One of the primary differences on grave vegetation was an observed increase in shoot height and biomass of common ragweed (*Ambrosia artemisiifolia*). Rapid colonization of the disturbed gravesites by annual grasses that were atypical of the study site was also evident. Further studies are currently in progress to investigate the effects of seasonal phenology, soil disturbance type, land use type, and inter- and intra-year variations.

Forensic Botany, Vegetation, Clandestine Graves

490 Forensic Science in the Continental and Anglo-American Systems of Law

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Undoubtedly, the common and civil law systems differ tremendously in many areas, especially in criminal law and procedure. Accordingly, this paper discusses the distinct understanding of the idea of forensic science in the Continental and Anglo-American systems of law. It presents the view that the scope of forensic science in the civil law system is much broader than in the adversarial system of law.

In the first part of the paper the author discusses which topics and issues are included in the idea of forensic science in both the inquisitorial and accusatorial systems. At this point the position of forensic science in the education of lawyers is also discussed. The second part is dedicated to an explanation of the reasons that created the different understanding of forensic science in civil and common law systems. One of these is the position of the prosecutor and his involvement in the preliminary investigation in the criminal procedures of both systems of law. The paper then presents a short discussion of the distinction between criminal procedure in the Continental and Anglo-American law systems. Finally, the author concludes with some proposals with regard to the standardization of the idea of forensic science around the world.

Common Law, Civil Law, Comparative Law

562 Hydrogen Cyanide: Is it Overtaking Carbon Monoxide as the Silent Killer in Domestic Dwelling Fires?

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The project was divided into two different sections. Initially the project sought to demonstrate hydrogen cyanide (HCN) could be detected prior to carbon monoxide (CO) during the thermal assault of polyurethane (PU). The investigation sought to examine samples of all kinds of PU used in domestic dwelling construction and decoration. Data was collected at temperatures prior to the combustion temperature of PU demonstrating that HCN was detected during prolonged thermal assault while the detection of CO remained minimal. This section of the project was designed to highlight HCN as a significant contributor to fatalities resultant from inhalation in domestic dwelling fire scenarios.

The project also endeavored to gather data to accurately define whether the time till flash over of a cell or structure was directly proportional to the concentration of polyurethane present in a domestic dwelling. This section of the study was completed in small scale tests and as full scale scenarios.

The study utilized Australian-made and American-made PU that required little physical or chemical manipulation. Limiting the manipulation of the sample was seen to be crucial in order to best emulate a real life scenario. In order to gather broad data regarding the PU available in Australia, the samples tested consisted of a portion that contained flame-retardants and a portion that did not.

Fire, Hydrogen Cyanide, Flash Over

112 Childhood Interrupted

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The objectives of this presentation are (1) to create awareness among public officials who work with victims of the Battered Child Syndrome; (2) to document and report violence against children in Colombia through a case study; (3) to show the weaknesses of government agencies responsible for the protection of the fundamental rights of children in Colombia; (4) to inform the public of the dramatic day-to-day life of Child Abuse victims; and (5) To urge government agencies to protect the constitutional principles of child defense and protection.

This research is based on a case study of a child that arrived in the morgue of the Colombian Institute of Legal Medicine and Forensic Sciences, Bogotá Regional Office – Colombia. The child was a victim of child abuse. A multidisciplinary forensic approach was adopted to conduct retrospective research based on the closed case files found at the Attorney General's Office. Information was collected from the autopsy protocol. Subsequently, the child's close relatives were interviewed. A 40 minute video was made, based on the information provided by the maternal grandmother, the father, the stepfather, the mother, the school's principal, and the investigator, among others. The video is a reconstruction of the child's life and death.

Childhood Interrupted is a narrative documentary of Catlin's story. She was a five-year old girl that arrived at the morgue of the Coroner's office after suffering a series of traumatic injuries that lead to her death. The video is a chronological reconstruction of the child's life, based on testimonies of the people that interacted with Catlin during her life.

Child Abuse, Nonchalance of Authorities, Complaint

467 Population Study of 17 Y- STR Loci in Colombian Caribbean Coast Population and Forensic Application

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Genetic markers such as Y-Chromosome Short Tandem Repeats (STR) are being used as a tool for population and forensic studies. The purpose of this study was to determine the allelic frequencies and the haplotypic composition of 305 unrelated male individuals from the Colombian Caribbean states of Atlantico, Bolivar, Magdalena, Sucre, Cesar, Cordoba, and Guajira, using 17 Y-Chromosome STR markers (Y-STR) included in the AmpFISTR® Yfiler™ kit and to validate its applicability in the forensic area.

Two hundred and ninety three (293) haplotypes were identified. Of those, 283 were unique haplotypes and the remaining 10 haplotypes were found twice or three times in the Caribbean population. The haplotypic diversity exceeded the values obtained in other populations studies, ranging from 99.66% in the Sucre population to 99.99% in the Cordoba population. The overall haplotypic diversity (99.97%) and the discrimination power (96.1%) of these groups were also calculated.

In order to evaluate the usefulness of the markers included in this study, 14 additional forensic cases were analyzed, all of which were previously typed with autosomal STR markers by the Genetics Lab of the National Institute of Legal Medicine and Forensic Sciences (INML y CF). Several negative cases showed positive results when Y-chromosome markers were used.

The results of this analysis showed that wide genetic heterogeneity could be obtained among the Colombian Caribbean population using 17 Y-STRs. This means that the data reported are a useful reference to be applied in forensic analyses with Y-chromosome markers in Colombia.

Colombia, Caribbean Coast, Y-Chromosome

115 The Biochemical Alteration of Soil by Decomposition Products

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Decomposition chemistry refers to the chemical degradation processes which occur in soft tissue as decomposition proceeds. These processes involve the breakdown of the body's main constituents which include proteins, carbohydrates, and lipids. Lipids represent an important biomarker of decomposition as they are not easily degraded and can be retained in the soil environment for extended periods of time. The aim of this study was to investigate the relationship between the release of decomposition fluids into a soil environment and their potential correlation with the postmortem period. This study utilized soil from a decomposition period of 100 days to determine the total microbial biomass by measuring the extractable lipid phosphate content, as well as investigating variations in soil extractable phosphorous, pH and fatty acid methyl esters. The study identified a significant increase in the abundance of soil extractable phosphorous released into the soil. Lipid-phosphate concentrations also increased confirming that there was a flux in the microbial biomass present in the soil. Although the preliminary results could not be directly correlated with postmortem interval, this pilot study was able to highlight the forensic potential of these techniques and the necessity for further research in this area.

Decomposition, Soil, Postmortem Period

198 The Potential Application of Grave Soil Analysis in the Determination of Post-Burial Interval

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Forensic investigators are often required to locate and recover decomposed or skeletal remains from a clandestine grave site. One of the important determinations of recovered remains is the estimation of post-burial interval (PBI), which often closely correlates with time since death of the individual. By focusing our research efforts on the chemistry of grave soils, we hope to gain a better understanding of the chemical composition of the soil at different intervals in the decomposition process. This study investigated the decomposition of pig carcasses in shallow grave sites over a 3, 6, and 12-month period. Soil samples were collected from the base and grave walls for analysis. Samples were analyzed using gas chromatography-mass spectrometry and specific fatty acids present in the soils were identified and quantified. Both unsaturated (oleic acid, linoleic acid) and saturated (arachidic acid, stearic acid, palmitic acid, and myristic acid) fatty acids have been identified in varying ratios. This presentation will discuss the correlation of fatty acids in soil with the stage of decomposition and postmortem period. The results indicate that there is a potential link to post-burial interval of decomposed remains. This research will contribute to the long-term goal of understanding the decomposition chemistry of human remains, particularly in soil environments.

Decomposition, Grave Site, Fatty Acids

214 What's Not Working Within 'What Works': Executive Cognitive Functioning Capacity of First Time Federal Offenders, Return Offenders, and Controls

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There is now a compelling literature demonstrating that imprisonment alone is insufficient to deter offenders from future criminal activities. Accordingly, Correctional Services Canada has, over the past several decades, implemented various remediation programs in an attempt to reduce recidivism rates. Reports of recidivism reduction in relation to remediation programs have, unfortunately, been somewhat inconsistent, with reductions ranging from 0% to 58%. One factor that may be related to propensity for re-offending that has received little attention is the constellation of cognitive abilities referred to as the "executive cognitive functions" (ECF). Executive function refers to higher order cognitive abilities involved in goal-directed behavior, including cognitive flexibility, strategy formation, response monitoring, working memory, and inhibition. Generally speaking, these abilities represent behaviors relevant to effective problem-solving and decision-making. Extant research has consistently shown various ECF deficits in incarcerated offenders, with some researchers linking these deficits to recidivism. Unfortunately, little is known about whether existing remediation programs have any impact on ameliorating executive dysfunction, and none appear designed specifically to do so.

Of the 140 male participants, 95 were offenders incarcerated in one of two medium security federal institutions within Canada. Controls consisted of 45 males recruited from the community of London, Ontario. Participants completed four behavioral measures of ECF, and information regarding enrollment in correctional programming was obtained. A multivariate analysis of variance revealed that 'Return Offenders' (i.e., those who had served at least one prior federal sentence) performed significantly worse than both 'First Time Offenders' and controls in the areas of strategy formation, working memory, response monitoring, and impulsivity. Surprisingly, First Time Offenders were not statistically different than controls on any of these variables. With respect to programming, contrary to the hypothesis, the number of completed programs was positively corrected with poor performance on some ECF measures, indicating that being engaged in more programming was actually associated with poorer executive functioning.

Understanding the distinctions in executive abilities between subgroups of offenders may aid in the accurate classification for risk of recidivism. Furthermore, the results suggest that correctional remediation programming may be lacking a specialized element of ECF training. Other types of remediation which focus on attenuating executive dysfunction, such as those involved in rehabilitating individuals with head injury or schizophrenia, may inform future research.

Male Offenders, Prison Rehabilitation, Executive Cognitive Functioning

701 The Mass Graves Investigation Team in Iraq: Challenges in Forensic Archaeology

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In May 2004, President Bush signed a presidential directive ordering the Departments of Justice and State to create an office that later became known as the Regime Crimes Liaison Office. Its function was to provide support to the Iraqi High Tribunal in their prosecution of members of Saddam Hussein's former regime. One of the primary components of the order was the establishment of a scientific team to gather archaeological forensic evidence. From August 2004 to April 2007, the Mass Graves Investigation Team excavated nine graves, analyzed the evidence, and prepared reports for the Iraqi High Tribunal. Evidence collected from three of the graves was given as testimony to the Iraqi High Tribunal as part of the Anfal trial in November 2006. This paper will describe the composition of the team, the logistics required in a combat environment, and the strategy and tactics employed to provide accurate forensic data.

Mass Graves, Archaeology, Logistics

702 The Application of GIS in Forensic Archaeology: Karbala, Iraq

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In early April 2006, the Mass Graves Investigation Team (MGIT) conducted a reconnaissance in a remote desert location southwest of the city of Karbala, Iraq. During this survey, four sites associated with the 1991 Shia uprising were found to contain human remains and all four graves were excavated. Critical to every stage of the Karbala field project (i.e., reconnaissance, survey, and site excavations) was the use of Geographic Information System (GIS). Satellite imagery was incorporated and examined for indications of landscape anomalies that warranted on-the-ground investigation.

By meticulous mapping evidence at the site, including ballistic artifacts, human remains, cultural objects, and the original grave trench, and incorporating this information within the project GIS, a relatively rapid reconstruction of the crime event was generated. Incorporating information from other analytical units of the MGIT (e.g., Pathology, etc.) further expanded the exploratory power of the GIS in the investigation of the manner and characteristics of the mass execution. Analytical and visualization techniques were employed to investigate and illustrate the various site formation processes that resulted in the disposition of the human remains as found.

GIS, Mass Graves, Reconstruction

440 Sabre 4000 - Determination of the Detection Limits for Common Explosives

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The number of incidents connected with the activity of terrorists grew rapidly during the last decade. For this reason, there is a strong need for a sensitive, specific, and convenient method for the identification of hidden explosive materials and their traces on post-blast residues. Analytical methods currently available for the identification of the explosives include separation techniques such as gas chromatography (GC), high performance liquid chromatography (HPLC), and capillary electrophoresis connected to specific detectors. The detectors commonly in use are electron capture (ECD), thermal energy analyzer (TEA), chemiluminescence, and mass spectrometry (MS) working in the electron-impact ionization (EI), atmospheric pressure chemical ionization (APCI) or negative chemical ionization (NCI) modes. Unfortunately, the conventional analytical instrumentation has failed to gain a general and wide acceptance as the solution for out-of-lab chemical monitoring. Almost every instrument presumes the presence of the sample that is relatively clean and contains sufficient analyte for detection. For this reason, the time consuming and costly sample pretreatment as well as the assistance of highly skilled laboratory personnel are necessary. The analytical technique that helps avoid these requirements is ion mobility spectrometry (IMS). The operation of IMS is similar to the operation of time-of-flight mass spectrometry (TOF) and gas chromatography, the difference being that TOF instrumentation works under vacuum conditions whereas GC operates with compressed gases. As a consequence, IMS evades the excessive hardware such as vacuum systems or gas cylinders. These features, the growing need for more convenient and more easily operated instrumentation, more frequent sampling, and more rapid responses gave the impetus for the construction of IMS based hand-held detectors. One of these is the SABRE 4000, which has been designed and successfully introduced on the market by Smith Detection.

The objective of this work was to establish the detection limits for common explosives using the commercially available SABRE 4000. The following compounds have been taken into consideration: TNT, octogen, PENT, hexogen, ammonium nitrate, nitroglycerin and three isomers of dinitrotoluenes. In order to avoid uncertainties connected with the exact amount of samples collected and analyzed, the compounds under investigation were placed directly onto filter paper as a solution of known concentration. For TNT, octogen, PENT, and hexogen the precision of four replicate determinations on each concentration level was established. For example, repeatability of the high peaks for TNT was 2.5 to 25.5% RSD in the range of 0.21 to 3.42 ng. The measured limits of detection ($S/N = 3$), expressed in ng per sample ranged from 0.15 ng for hexogen to 10 ng for ammonium nitrate. The repeatability of reduced mobility for early eluting compounds (3,4-DNT, $K_o=1.5484$) and the compound with the longest drift time in this study (PENT, $K_o=1.1460$) were 0.023 and 0.028% RSD, respectively. Such high repeatability assures the reliable identification of compounds under investigation. The possibility of simultaneous detection of complex mixtures containing two or more common explosives was also tested.

Acknowledgments: The SABRE 4000 used in this study was provided by Pimco SP. Z o.o.

Explosives, Post-Blast Residues, Ion Mobility Spectrometry

523 Head Volume Rendering Through Cone Beam Computed Tomography Imaging as a New Method in Forensics

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After this presentation, attendees will be able to assess the value of cone beam computed tomography (CBCT) imaging and head volume rendering for use in forensic sciences, such as forensic identifications, death investigations, possible new age estimations and sex determination methods, anthropology, and others. Since its introduction in the market in 2001, CBCT imaging has undergone remarkable progress. Currently, CBCT units are capable of producing high spatial resolution isotropic and isometric images with voxel sizes of less than 0.1 mm, within an image volume that includes all the head area, with a low radiation dose. Numerous experimental studies have confirmed the geometric accuracy of CBCT images compared with direct anatomic measurements. Several specialized computer software programs such as Accurex, N-Liten3D, OnDemand 3D, and Mimics®, have user-friendly tools for volume rendering. This tool provides three-dimensional reconstruction of the hard tissues in the imaged area. This allows clear visualization of the osseous structures, teeth and any metallic objects. Further, most of the programs in radiology have tools that can aid in forensic purposes, such as protractors, measurement tools and volume segmentation. Several images and pictures with details of possible future forensic research will be presented. The purpose of this study is to examine the value of volume rendering through CBCT imaging as an adjunct technique for forensic purposes.

Methodology: Forty patients previously imaged by several CBCT units for medical purposes were studied. Digital Imaging and Communications in Medicine (DICOM) images were saved and later imported into OnDemand 3D software for this retrospective study, due to the program's ability to provide 3D rendering of the imaged area. Several tools were examined including protractor and measurement tools.

Discussion: Traditionally, 3D reconstruction gives a clear understanding of the orofacial structures, which is valuable in cases with severe morphological relationships or abnormalities and for surgical planning. It was found that any pathology or abnormality stated in the radiology report was noted in the volume rendering, unless the pathology was within the bone or in the periapical area of any tooth.

CBCT is an isotropic imaging modality. Thus with proper orientation, any measurement of any angulation on the computer screen through the protractor is accurate and precise. Measurements of any type in sagittal, coronal and axial views can be performed as well. Gunshot areas in the skull and fractures of the maxillofacial complex can be clearly visualized.

Conclusions: Volume rendering is valuable for assessing hard tissue structures. Several studies in forensic sciences have attempted to perform measurements on dry human skulls or cephalometric images. With 3D era, CBCT can be acquired and a precise structure size or an angulation measurement on either CBCT images or volume rendering pictures can be performed. This may be the interest of further research in forensics. Since a gunshot area in the skull can be clearly visualized, it is speculated that CBCT acquisition with volume rendering and segmentation might be a possible alternative to an autopsy in homicide and suicide cases. Volume rendering pictures would be useful for courtroom presentations. This presentation will impact the forensic community and/or humanity by enhancing the awareness of volume rendering and its applications in forensic science.

Volume Rendering, Cone Beam CT, Identifications

581 Research on Recognition of Dynamic Images in Surveillance Video

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Research on recognition of dynamic images in surveillance video is a new research field following DNA identification, fingerprint identification, iris identification, and other biometric identification technologies. In this study, selected persons familiar with the images recognized the dynamic images recorded by the surveillance video by specific characteristics of the individual's walk, which are based on the physical characteristics of human congenital and acquired characteristics of the different acts. Firstly, 50 dynamic images of positive/ frontal, profile, and back were recorded by video cameras to imitate surveillance video. Next, three categories of individuals were selected to review the images in order to recognize the differences between the monitoring of dynamic video portraits of the contemporary character and walk features and dynamic features such as repeated observation and memory of the people familiar with the identification: 50 persons quite familiar with the images; 50 persons generally familiar with the images; and 50 persons slightly familiar with the images. Lastly, based on statistical principles, the following conclusions were obtained: the recognition rate of the images of back, positive/ frontal, and profile were 70%, 82%, and 78% respectively identified by persons quite familiar with them; the recognition rate was 65%, 78%, and 69% by persons generally familiar with them; and the recognition rate was 34%, 53% and 42% by persons slightly familiar with them. Since the recorded persons were students of the university, the final result should subtract 10% from the obtained recognition rate because of the psychological implication factor. This research showed that recognition of dynamics has a practical value and it can be used to identify suspects in practice and may decrease the scope of investigations.

Dynamic Image, Characteristics of Human Walk, Recognition Rate

Quality Assurance and Laboratory Management

721 Panel Discussion – International Issues in Forensic Science Laboratory Accreditation

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Forensic science laboratory accreditation is an essential tool in building the highest possible quality system in an environment where errors can have severe repercussions on the lives and liberty of individuals. In the past decade, technological advances in areas such as DNA analysis have assisted in uncovering past miscarriages of justice, many of which have implications for forensic science laboratories. This has resulted in a re-examination of how these laboratories operate and in a renewed commitment to quality. Forensic science has caught the attention of the media, the public, and advocates for the wrongfully convicted. Now, more than ever, there are vocal demands on laboratory managers to ensure quality standards.

An international panel of experts and laboratory directors will discuss the state of accreditation and associated issues from the perspective of their geographic areas. The panel will include members from South Africa, China, and the United States and will include the following paper that was submitted as an abstract to this conference.

Quality Assurance, Panel Discussion, Laboratory Accreditation

481 The General Situation of Accreditation for Forensic Science Laboratories in China

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The accreditation of forensic science laboratories has been used since the 1980s in the West to standardize laboratory quality management and technical operations in order to make the results more reliable and scientific. The accreditation of forensic science laboratories started later in China. Until 2003, there was only one laboratory accredited by the CNAS (China National Accreditation Service for Conformity Assessment) in compliance with the International Standard ISO/IEC 17025:2005 "General Requirements for the Competence of Testing and Calibration Laboratories." To date, a total of eight laboratories have been accredited. Although the number is fairly impressive compared with some other countries, it is only 0.15 percent of all of the forensic science laboratories in China and this needs to be improved. There are also some outstanding issues that need to be resolved. First, the accreditation of forensic science laboratories should be mandatory. Secondly, there is controversy in China surrounding the application of accreditation standards. The standard of ISO/IEC 17025 is suitable to DNA analysis, physical and chemical analysis, but whether it is also suitable for other examinations, such as autopsies, identification of the living, and questioned document examination is not certain. Thirdly, management and professional organizations do not pay adequate attention to forensic science laboratory accreditation and do not provide proper guidance. The last issue is that the common standard of ISO/IEC 17025 is the only form of forensic science laboratory accreditation available in China.

Laboratory Accreditation, ISO/IEC17025, Forensic Science

715 ASCLD/LAB's Guiding Principles of Professional Responsibility

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This presentation will provide attendees the opportunity to discuss American Society of Crime Laboratory Directors – Laboratory Accreditation Board's (ASCLD/LAB) proposed Guiding Principles of Professional Responsibility for Crime Laboratories and Forensic Scientists, and a proposed analytical framework for determining the seriousness of deviations from these Principles. The purpose of this presentation is to encourage discussion and garner input into these guidelines from members of the community served by ASCLD/LAB.

These Guiding Principles, posted at www.ascl-d-lab.org, enhance the forensic science community's culture of values within crime laboratories and heighten public confidence in experts and their results. Unlike many codes of ethics that are general principles of ethical behavior, these Guiding Principles are specific to the laboratory process and expert testimony. In addition, the Principles provide discussion points for professional responsibility training for forensic scientists that may be used to comply with ASCLD/LAB's ethics training requirement.

ASCLD/LAB, Guiding Principles, Quality Assurance

Quality Assurance and Laboratory Management

599 Proficiency Testing for Imaging and Audio Enhancement: Guidelines for Evaluation

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Proficiency tests in the forensic sciences are vital in the accreditation and quality assurance process. Most commercially available proficiency testing is available for examiners in the traditional forensic disciplines, such as latent prints, drug analysis, DNA, questioned documents, etc. Each of these disciplines is identification-based. There are other forensic disciplines, however, where the output of the examination is not an identification of a person or substance. Two such disciplines are audio enhancement and video/image enhancement.

Examiners in enhancement fields rely on a set of measurement tools and subjective experience to determine the usefulness of the output product. Examinations are generally carried out on evidence such as audio or video recordings. The exams typically entail an iterative process whereby an examiner uses a series of filters and other processes to improve the intelligibility of the speech in a recording or the visual appearance of an item in video. The purpose of the examination is to provide the submitter with more detail, aural or visual, than they had before the submission. Assessing when this type of examination has reached diminishing returns is a judgment based on examiner experience.

Proficiency tests provide insight into when and where more training might be needed and if more quality control checks might be called for. Testing in the fields of video and audio enhancement, as in all forensic sciences, is important to ensure that examiners are using reliable techniques that result in quality output. Since these examinations do not result in identification or elimination, a different set of tools is necessary for evaluating the proficiency of these examiners. The authors drew from the fields of auditory and visual perception to assist them in crafting a meaningful proficiency test for examiners using video/audio enhancement.

Proficiency testing in these fields addresses classic challenges in intelligibility and perception. In creating recordings for proficiency testing, it is very difficult to artificially and believably degrade speech to the extent that listeners cannot understand the words. Furthermore, if the speech is degraded too severely, very few tools exist to improve the speech enough so that listeners can recover the words. Setting up such a test, however, might be an unfair hurdle for a laboratory because it does not mimic a typical case.

Another option would be to move towards a general "quality" test. This would entail a battery of perceivers (listeners or viewers) being presented with various stimuli. For audio enhancement, the stimuli would be either a set of words or spontaneous speech. The stimuli would be presented in the same three conditions: clean, degraded, and enhanced. The listeners would then judge whether the enhanced version was more listenable. An option for evaluating audio intelligibility would be to have the listeners transcribe the speech (a short sample) and measure their accuracy.

For image quality assessments, objective assessment algorithms tend to measure errors between an output image and a reference image. These algorithms, however, do not necessarily correlate with perceptual quality. Subjective perceptual quality assessments, then, should provide a better measure of the success of a video enhancement. Subjective perceptual quality assessment tests could use human observers to rate the quality of an enhanced image by scoring how close the enhanced image is to the reference (clean) image. An option for evaluating video intelligibility would be to have the viewers detect/describe/transcribe objects (e.g., license plate numbers) in the frame(s) and measure their accuracy.

Proficiency Tests, Enhancement, Digital

34 The Evolution of Forensic Proficiency Testing: From Science Based to Policy Driven

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Forensic scientists have always been concerned about quality. Forensic science laboratories have participated in quality control and quality assurance activities as long as they have existed. These activities were simply thought of as good laboratory practice. Most laboratories also had programs of internal competency testing for trainees and evaluation of new procedures although they may not have thought of them as "proficiency testing." Until the late 1970s, however, few had organized programs of proficiency testing for all members of their staff.

From 1974 to 1978, the Forensic Sciences Foundation Inc. (FSF), with the assistance of a contractor, Collaborative Testing Services Inc. (CTS), conducted a research project on the feasibility of a large-scale proficiency testing program for forensic science laboratories. Following publication of the report in 1978, lab directors recognized the value and importance of proficiency testing and, through ASCLD, asked FSF and CTS to develop an on-going proficiency test program.

Initially, the focus was on tests that as closely as possible reflected "real world" case samples. The primary interest of the participants was how well their examinations and results compared with those of a large number of other similar laboratories. The emphasis was on the science/technology, the validity of the results, and what, if any, improvements were necessary and/or possible. Review of the results and any subsequent action was left to the individual lab directors. Because of this "self-evaluation" process, it was possible (and sometimes requested) that some tests present significant challenges to the participants.

The introduction of a forensic laboratory accreditation program by the American Society of Crime Laboratory Directors Laboratory Accreditation Board (ASCLD/LAB) in 1981 resulted in additional recognition of the importance of proficiency testing. ASCLD/LAB has since established criteria for the design and manufacture of proficiency tests and approval of test providers. The accreditation program required

Quality Assurance and Laboratory Management

a laboratory to have a program of proficiency testing, including tests from approved external providers, and has incorporated requirements that tests be performed according to a laboratory's established policies for casework of the type and for the laboratory's quality assurance program.

As the accreditation program(s) evolved, so have external proficiency testing programs. Accredited laboratories, depending on the accrediting body, must agree that copies of their proficiency testing results be made available for review, either by discipline specific Proficiency Review Committees (PRCs) or during on-site audits by the accrediting body. Thus the program has progressed from a strictly self-evaluation process to one in which external review can impact on a laboratory's accreditation status. This has resulted in proficiency testing programs that are much more policy driven and less science based. Examples of the effect of this change on such things as test designs, production, results reporting, etc. will be presented.

In addition to the influence of accreditation, the significant increase in participation in the proficiency testing program by international laboratories has also impacted on the policy driven nature of the program. Different legal requirements and indeed even different legal systems (e.g. inquisitorial vs. accusatorial) impose different responsibilities on participants. Just one example is the case law in the United States, which requires that potential exculpatory information such as an unacceptable result in a proficiency test be disclosed in advance; similar requirements do not necessarily exist in other jurisdictions. These will also be discussed.

Proficiency Testing, Accreditation, Evaluation

167 Counterfeit Currency

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The counterfeiting of currency has emerged as one of the most serious economic offences worldwide. It not only causes a serious setback to the world economy, but also jeopardizes genuine trade and commerce. Mahatma Gandhi, father of the nation, said, "There is sufficiency in the world for man's need but not for man's greed." Such type of crime is generally committed by the person who suffers from "Get Rich Quick" syndrome. Recent developments in photographic and computer technology, as well as in printing devices, have facilitated the relatively easy production of counterfeit currency, thereby increasing the threat of this criminal activity. The seizure of higher denomination counterfeit currency has shown a marked change from the year 1990 onwards, not only in terms of value but also in printing quality, despite the fact that several security measures were initiated by the Reserve Bank of India. The quality and texture of counterfeit currency circulated by some of the offenders is highly sophisticated. Thus, the detection of such counterfeits would require extensive knowledge of all the security features as well as an expertise in their recognition. In the recent past these notes in various denominations have been submitted to the authors' laboratory to ascertain their genuineness. The exhibits were analyzed using instruments such as the VSC 2000, stereomicroscope, etc. This presentation describes and compares the security features found in the Indian 50, 100, 500, and 1000 Rupee notes.

Currency, Examination, Video Spectral Comparator

377 Application of the Raman Spectroscopy and μ -XRF Method for Examination of Laser Printer Toners

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The printing of documents using laser printers has increased dramatically within the last ten years. Additionally, the number of crimes in which documents have been produced by these techniques have also significantly increased. In order to differentiate the toners on questioned documents, two non-destructive analytical methods were applied: the Raman spectroscopy and μ -energy-dispersive X-ray fluorescence spectrometry (μ -XRF). Eight black toners were examined; the toners came from HP, Canon, Epson, and Samsung laser printers, which are currently widely used brands in China. The toners were analyzed by Raman spectroscopy directly on the paper samples. The samples were classified into 3, 5, and 5 groups using three laser excitation wavelengths 514, 633, and 785 nm, respectively. The highest discriminating power is 89%. Investigated by μ -XRF with a spot size of approximately 100 μ m, the toner samples were divided into 7 groups according to elemental composition, and 96% of the samples were distinguished. However, when the printing samples were examined directly on the paper, only four groups were obtained and the discriminating power decreased to 75%. Although the toners were penetrated by X-ray, the resultant signals originating from elements in the toner were also influenced by those in the paper. All eight samples could be distinguished based on the obtained Raman and μ -XRF spectra. It was ascertained that the combination of both of these techniques offers an effective method and allows examiners to perform a non-destructive analysis of toners on documents.

Questioned Document Toner, Raman Spectrometry, μ -XRF

17 Determination of Paper Types and Additives Using Direct Analysis in Real Time Mass Spectrometry (DART-MS)

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The Library of Congress is using a JEOL AccuTOF-DARTTM mass spectrometer to develop a comprehensive mass spectral library of paper types and additives (sizing, glues, coatings, etc.) that are present in the Library's collection. The DARTTM ion source, which is physically distant from the TOF (time-of-flight) mass analyzer by approximately 1.5 cm of open space, emits stream of excited-state helium atoms whose temperature can be varied from ambient to approximately 500 °C. This stream of helium, and the reactant ions contained therein, collides with analyte molecules present on the surface of a paper or other type of sample that is inserted between the DARTTM and the mass analyzer. There are several critical experimental parameters that impact how well the mass spectra reveal differences in paper type and additives. One is the temperature of the stream of helium exiting the DARTTM. Ambient (approximately 50 °C) temperature provides for non-invasive direct analyses of highly volatile indicator compounds, such as formic acid that reveals paper aging. Higher temperatures (approximately 150-230 °C) result in the detection of less volatile compounds, such as organic additives (different paper sizings), plasticizers, and components present in human fingerprints (fatty acids, squalene, others). Pyrolytic temperatures (> 230 °C) result in differentiation of different paper types, such as cotton vs. hardwood vs. high-lignin papers, and also reveals the type of binder/glue present (animal proteins vs. plant carbohydrates). Averaging the individual mass spectra from all the different temperature

Questioned Documents

regimes acquired during a 3-minute analysis of a piece of paper results in one unique composite mass spectrum that reveals all the above information. Another critical parameter that significantly impacts sensitivity and spectral reproducibility is distance of the DART™ ion source from the opening of the mass analyzer. Experiments can be performed using fragments of paper that are of 500 microns in size by having the DART™ ion source positioned closer to the analyzer opening than is done in other forensic applications. The experimental procedures being developed at the Library, and the data being acquired, can be applied to the forensic analysis of papers that are of interest to the criminal justice community.

Mass Spectrometry, Paper Identification, Paper Additives

534 Examination of Secondary Latent Type Impressions - A Novel Method

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The latent impression on documents sometimes obtained from the crime scene becomes a very important piece of evidence in cases of suicide, murder, fraud, abduction, etc. The latent impressions are usually of two types, i.e., primary and secondary. Primary impressions occur by direct transfer from the writings on the page above to the page below, whereas the secondary impressions are caused by some degree of lateral relative motion of two sheets of paper. The latent impressions are not only caused by handwritings, but can also be found on the backing sheet or on sheets of carbon paper used when typing a document. A number of instrumental based methods are employed by forensic document experts for the examination of secondary impressions on paper. However, such methods fail to detect impressions on glossy paper, paper of high basis weight, lithography or gravure printed paper, and polyvinyl sheets. This paper describes a novel method for the detection of secondary type impressions from the lamination sheet of an identity card found near a partially mummified corpse. The deciphered impressions on the identity card helped in establishing the identity of the dead body.

Secondary, Impression, Decipherment

636 Reflection Transformation Imaging (RTI) and 3D Evidence Capture

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Reflection Transformation Imaging (RTI) is a technique being developed and refined to create digital records of historical artifacts as well as works of art. A few seconds of viewing time immediately brings to mind numerous forensic applications for this technology. RTI uses methods developed by Hewlett Packard Labs, but that are in the public domain (for not-for-profit purposes).

"Polynomial Texture Maps (PTMs) are made from information derived from multiple digital photographs of a subject shot from a stationary camera position. In each photograph, light is projected from a different direction. This process produces a series of images of the same subject with different highlights and shadows. After the light has been projected from a representative sample of directions, all the lighting information from the images is mathematically synthesized using a method developed by Tom Malzbender and Dan Gelb at Hewlett Packard Labs."

The current presentation will provide a description of the state-of-the-art of this image capture process, as well the technology used to establish the "empirical provenance" of the final image. The presentation will feature PTMs of various types of forensic evidence from a variety of disciplines.

Image Capture, Watermarks, Toolmarks

378 The Microscopic Characteristics of the Crossing Area in Sequencing of Stamp Impressions and Written/Printed Words

Xu Yang, Shaopei Shi, Che Xu, and Huanggui Qian, Institute of Forensic Science, Ministry of Justice, Guangfu Xi Road 1347, Shanghai, 200063, PR China*

Stamps are extensively used in China. Formal documents produced by or between government agencies and business companies are usually required to be stamped or to be stamped after signing. Even in individual affairs, it is a tradition to leave fingerprint or personal stamp impressions on important documents such as wills and receipts for a loan. Therefore, the sequencing of stamp impressions and printed or written content has a significant meaning in determining the authenticity of the documents. As a rule, documents that are stamped after the content are considered authentic and acceptable. On the other hand, documents produced in by the reverse order are highly suspect and often regarded as invalid.

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Microscopic examination, which is fast and non-destructive, is currently the most widely used method for the determination of the order of stamp impressions and printed or written words. However, due to the diversity of the office equipment and writing instruments used to produce to content as well as the media used to produce the stamp impressions, the microscopic characteristics of the intersection between impressions of various kinds of stamp impressions and printed or written words are complicated and such cases can be hard to handle. In practice, examinations often end in inconclusive or even contradictory opinions. To resolve this problem, a systematic study was conducted using a spatial stereomicroscope. Microscopic characteristics of intersections between words produced by different office machines (laser printer, inkjet printer, and photocopier) or pens (ballpoint pen, gel pen, and fountain pen) and impressions of stamps made from different stamp media (stamp ink paste, stamp inkpad, and special stamp-pad inks) were investigated; and a picture library of microscopic characteristics was established. Based on this study and the results of blind tests, the microscopic characteristics of both sequences for each specific combination of office machine or writing instrument and impression media were summarized, and points of importance for examination were determined. Guidelines and evaluating criteria for the determination of the sequence of stamp impressions and text by microscopic examination will also be discussed.

Questioned Documents, Sequencing of Stamp Impressions and Printed/Written Words, Microscopic Characteristic

642 Potential Applications of Interferometry to Questioned Document Analyses

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This presentation demonstrates some of the potential information that can be afforded through the collection of surface metric data using an optical profiler. A basic overview of the principles of interferometry, including its limitations and strengths, will be given.

An overview of potential applications of this technique to the field of questioned documents will be discussed. In particular, we will examine the potential to extract qualitative and quantitative data, which may serve to complement other techniques, in the determination of selected impact and relief printing processes characteristics.

Interferometry, Quantification, Printing Processes

376 Three Issues Related to Identification of Stamp Impressions

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In China stamping is an important means for validation of documents, and therefore identification of stamp impressions is the most frequent request, except for comparison of handwriting, in questioned document examinations. At present, with the advance of science and technology, new problems such as forged stamp impressions made by high-level simulation techniques, altered stamps, and tampered documents using genuine stamp impressions are on the rise, posing new challenges for QDE professionals.

Based on practical experience and experimental study, forged stamp impressions made with high-level simulation techniques are introduced, which include impressions transferred from genuine stamp impressions, duplicated by color printing and photocopying, imprinted by forged stamps made with laser engraving, plate making, and photosensitive production techniques. Characteristics of different kinds of forged stamp impressions are analyzed and summarized. It is suggested that, besides traditional pattern comparison, special attention be paid to the investigation of imprinting manners, stamp type, ink distribution, and material properties of stamp impressions; and further, that in pattern comparison great importance be attached to variable characteristics relevant to imprinting time, retouching traces, as well as details of start, turn, end, and intersection areas of impression lines.

The altered stamp is the one that is artificially processed for some unauthorized purpose, particularly for evading forensic identification. Two kinds of altered stamps are introduced; one is treated by cutting or rubbing, changing the shape of stamp lines; and the other is dealt with by filling or ironing, repairing damage or tagging marks. Points of importance for examination of altered stamp impressions are discussed.

Another issue involves tampered documents with genuine stamp impressions. Such cases are encountered frequently, but examiners are often requested to identify stamp impressions. Practical examples are presented. Attributes of tampered documents are discussed and suggestions for handling this kind of cases are put forward.

Identification of Stamp Impressions, Forgery With High Simulation Techniques, Tampered Documents

395 The Study of the Relative Age of Seal Stamps by TLC

Shuang Hu, Chinese People Public Security of University, MuXidi, West District of Beijing, Beijing, 100038, China*

This paper studies the relative age of seal stamps by Thin Layer Chromatography (TLC). Through extensive experiments, we obtained a good curve for the dye ratio of "Xueao" stamp changing over time. This presentation also addresses the effect on the dye ratio of sampling amount and of the type of paper, and includes the best sampling amount. It is expected to provide some reference for the study of the relative age of seal stamps and further the knowledge base for document examiners.

Seal Stamps, Relative Age, Thin Layer Chromatography (TLC)

704 Well Founded Eliminations

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No abstract provided.

548 Forensic Study of Realty Male and Female Handwriting in Egypt

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Some writers describe handwriting as "brain writing" with the hand working as a plotter because it receives orders from brain. Therefore, handwriting is a human activity that initiates in the brain. Any human activity that may be accomplished by mental activity must be evaluated; the comparison of handwriting is not enough, but it must be evaluated according to the understood internal and external factors. The track of the hand movement and its track while actually writing must also be taken into consideration. These considerations lead to a brief discussion of the functioning of the human body's neurons and their effect on writing because the neurons process information, transmit it within human body, and collect the information to process, pass it to the other neurons, respond to the physical changes, carry signals from the neurons to the other cells. In doing so, they inform the brain about what is happening inside and outside the body, and also carry signals from the brain to the muscles and the other organs instructing them to respond.

Generally handwriting is affected by different factors, including physical, acquired, and transient ones, each of which can vary in the degree of influence.

The forensic study of handwriting samples of male and female subjects from Egypt shows very important results for forensic document examiners and others concerned with this field. These results involve the questions of whether the difference in sex affects the handwriting or not; that is, whether cultural variations in socialization, psychology, education, and work status affect the handwriting? In other words, is there a difference between male and female handwriting and how does the surrounding cultural context effect it?

Handwriting, Male Handwriting, Female Handwriting

380 Characteristic Features of Handwritings and Signatures Counterfeited by Copying

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Over the course of time many methods of counterfeiting handwriting and signatures have been created and classified. The results of direct copying with the help of transmitted light and the use of transparency are well known, as are those of indirect copying based on obtaining some intermediates clichés as the result of the transfer of graphic materials or of mechanic traces.

In all these situations the evidence of counterfeiting includes the perfect overlap of the questioned writing on the genuine one, which is often brought forward as a known sample for comparison.

The advent of computers gives rise to new possibilities to obtain good quality counterfeits, because of the easy way that they can build up graphic images by assembling fragments from different genuine writings.

Even in these cases some particular details appear that can be found by the document examiner and that in the end will be important in forming an opinion.

Characteristic, Handwritings, Signatures

552 Evaluation of the Individuality of Handwriting Using FLASH ID™ - A Totally Automated, Language-Independent System for Handwriting Identification

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Forensic document examiners routinely perform handwriting comparisons for writer identification. The underlying premise for such identifications is that each person incorporates distinguishing individual features into his/her handwriting. During *Daubert* admissibility hearings, the validity of this foundation of individuality has been challenged. A collaborative research effort addressing this challenge has resulted in FLASH ID, a totally automated language-independent system for handwriting identification. FLASH ID uses an innovative quantification of handwritten text and computationally intense statistical methods for discrimination among writers. This presentation will

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consist of three presentations focusing on: (1) development and functionality of the FLASH ID system; (2) statistical methods for biometric identification with handwriting; and (3) empirical testing to assess the individuality of handwriting and how it relates to *Daubert*.

The "FLASH ID" software package will be presented as a fully operational software system that can address the immediate needs within the forensic community related to using handwriting as a biometric identifier. The presenter will illustrate how individual features, available and quantifiable within a person's writing, can be empirically captured into a "loss less" data structure that preserves the topology and geometry of the original writing. Statistical algorithms are created to reduce the very large number of feature measurements down to a very few, called a writer's "biometric kernel," that captures those elements that link the writing to its writer. The Biometric Kernel is the statistically derived subset of those measurements that truly captures the essence of an individual's writing. Once the Biometric Kernel is established, FLASH ID can act on any unknown sample of handwriting and will return the nearest value in its handwriting reference database that provides the closest match to the questioned writing sample. FLASH ID represents a new approach toward using handwriting as a biometric identifier that does not attempt to replicate the actions of a Forensic Document Examiner. Rather, it brings to bear the power of what computers do very well—rapid capture and processing of large quantities of data—into the hands of forensic experts.

A method of quantification of handwriting originally applied to optical character recognition has been demonstrated to provide a powerful foundation for biometric identification using handwriting. A recognized character in a document is associated with a mathematical graph, which is an array of curves that intersect or end in vertices. The frequency pattern of graph types observed in a document for each separate alphabetic character is a very powerful biometric identifier of the writer of the document. For instance, using pair-wise comparisons of 292 copies of a modified London business letter written by 100 writers (approximately 3 documents per writer), this biometric identifier correctly linked the documents for each writer. A similar exercise using only segments of the London letters showed that about 50 characters suffice for identification with high accuracy. This exercise with discordant segments demonstrated that identification accuracy was context independent. Further, additional information about the writer's profile are obtained using a minutia level biometric identification, which is based on physical feature measurements on the graph associated with a character. Based on minutia level biometric kernel-based identification alone, the true writer of a questioned document will be retrieved from a database of known writers with high accuracy if that writer's minutia characterization is stored in the database.

As a residual biometric that can link individuals to documents, handwriting provides an important data source for both law enforcement and intelligence purposes. In the form of FLASH ID, the forensic science community will now have a tool that harnesses the power of automation to leverage the effectiveness of Document Examiners by capturing similarities embedded among multiple writing samples and graphically showcasing these similarities supported by the statistical analysis that led to their identification. The technology underlying FLASH ID is language independent; that is, the empirical and analytical techniques that power the handwriting-derived biometric process have been demonstrated to function in different languages with completely different scripts. In this way, FLASH ID will extend document forensics across language barriers—something that is not commonly practiced today.

FLASH ID represents a totally automated process for extracting graphical data from handwritten documents, analyzing this data using robust statistical methods and matching documents based on similarity of the captured writing. This presentation will highlight the high level features of this research, supported by more detailed poster presentations regarding the FLASH ID system, statistical characterization of handwriting using features derived with FLASH ID, and statistical concepts for assessing handwriting individuality.

Automated Handwriting, Individuality, Statistics

525 An Introduction to Typography for the Forensic Document Examiner

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In an age when the overwhelming majority of documents submitted for examination are produced on computer printers using adaptations of traditional printing type styles, the forensic document examiner needs a basic grounding in typography.

This workshop will provide an historical overview of some forensically relevant technical and design aspects of typography from Guttenberg to Grunge (including, of course, typewriter type styles).

After successful completion of this workshop, the forensic document examiner will be familiar with various internationally used systems for type measurement and typestyle classification, as well as with the nomenclature used to describe the classifying features and approaches to differentiate similar type designs.

Typography, Questioned Documents, Classification

207 Determining Whether Handwriting Has Been Altered From the Piling Point of the Writing Colorant on Sheet Fibers

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It has been found that many criminals often make some alterations of the wording, strokes, or numbers in the documents, such as in checks, contracts, etc., to change the original meaning. A thorough study of the problem has been made, finding that paper is a thin sheet of vegetable fibers, which interweave tightly after being processed. The surface of the paper is smooth when viewed with the naked eye, but the same surface appears rough and uneven under the microscope. With the use of a microscope, the inner fibers can be seen

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and it observed that many fibers go in different directions. The stroke shows a continuous and even line when observed with the naked eye, but under the microscope, the stroke is not a continuous line. Instead, it is observed that the line is composed of desultory points, which are all piled up on one side of the paper fibers. It is these colorant points that store the writing direction of the stroke. More colorant is left in micro-rifts and results in the piling-up of the colorant. Wherever there is piling-up, it can be proven that the moving direction of the stroke is from the piling side to the opposite side. Therefore it is possible to determine the moving direction of the stroke through observing the piling position of the colorant on the paper fibers under the microscope.

Criminals try to make their alterations of documents as close to the original one as possible in paint color and stroke thickness, as well as in writing structure. However, due to various conditions, they leave the evidence of their alteration. The goal of this study was to develop a new method to determine whether new words have been added or whether the original words have been changed by checking paint piling up on the paper fibers.

Paper is a thin sheet of fibers, which interweaves tightly after being processed. As we know, both sides of paper are sleek, even, and have a good absorbability for paint. However, in fact, paper is neither even nor smooth, when viewed under the microscope. The paper seems rough and uneven and many fibers go in different directions. When uneven paper is written on, from the microscopic point of view, the writing paint will not be absorbed averagely. That means some fibers would absorb more while others less. As is revealed by the experiments with the various writing paper commonly in use.

If observed with the naked eye, a stroke is a continuous and even line. However, under a microscope, a stroke is no longer a continuous line, but an intermittent paint point line, and all the paint point lines lay on one side of the paper fibers. It is these paint points that reveal the pen-running direction in writing. Through numerous observations on strokes written with different writing tools, this study proves that different writing tools or different paints will form different paint points, which in turn have specific characteristics.

Handwriting, Fibers, Microscopic Examination

298 Stable Isotope C13 Security Ink Development

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The goal of this study was to develop a security ink utilizing a stable isotope as a new type of tracer in public security. Carbon 13 is a stable, non-toxic, non-radioactive, cheap, and controllable isotope. It can be put into the computer print ink as a unique identifier. Two-way mass spectrometry shows that the security ink has some unique advantages, such as the stable isotope abundance, stable performance and high sensitivity. This study shows that a large number of security products may be developed using stable isotopes as a unique identifier.

Mass Spectrometry, Carbon 13, Isotope Abundance

342 The Use of a Single Solvent Extraction Method to Determine the Relative Made Time of Red Printed Text

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The goal of this study was to determine the relative made time of red printed text by a single solvent extraction method. During the experiment, thin layer chromatography (TLC) was used to measure the reflection absorption spectroscopy and chromatography graphics of red printed text. This paper provides a new approach of solving cases, which involve the determination of relative made time of red printed text in reality.

Single Solvent Extraction, Relative Made Time, Red Printed Text

366 Determining the Sequencing of Laser Printing and Seal Stamps Using the VSC

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Document examiners are frequently called upon to determine the sequence in which intersecting entries were made by Laser Printing and Seal Stamps. This determination is a difficult problem in the field of questioned document examination. This study investigates the possibility of determining the sequence of Laser Printing and Seal Stamps using the Video Spectral Comparator (VSC). It was found that the sequence of Laser Printing and Seal Stamps could be determined with a high degree of confidence.

The subject intersections were prepared to test both sequences of Laser Printing after Seal Stamps and Seal Stamps after Laser Printing. The points of intersection were examined by the VSC-2000. The spot light source was used to cause Seal Stamps to fluoresce. Corresponding intersections for the two sequences were compared. It was found that the continuity of fluorescence is different from the two types. This research makes the VSC a promising technique for questioned document examination.

Questioned Document, Sequences of Crossing Laser Printing and Seal Stamps, Uncontaminated Examination

384 Reveal of Writing Strokes From In-Between Rewritten Over Obliterated Writings for Clear Reading and Comparison Purposes

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Correctors are used to make corrections in ordinary handwritings. However, the correctors can also be used for document forgeries. In a previous paper (15th IAFS meeting), diethyl ether and other solvents, were used to reveal corrected handwritings. This study focused on the analysis of a bill presented for forgery detection. The signatures contained in the bill had been corrected, but only one signature was requested. A scientific method was used to reveal the requested signature after writing over corrected signatures. To save the new signatures, photographs were taken before and after the revealing process. The method presented in this study could be very useful to questioned document examiners.

Writing Strokes, Correction, Reveal

395 The Study of the Relative Age of Seal Stamps by TLC

Shuang Hu, Chinese People Public Security of University, MuXidi, West District of Beijing, Beijing, 100038, China*

This goal of this preliminary study was to determine the relative age of seal stamps by Thin Layer Chromatography (TLC). Through extensive experimentation, a good curve was obtained for the dye ratio of "Xueao" stamp changing with the date. The study also analyzes the effect of sampling amount and paper on the dye ratio and a determination of the best sampling amount. The study was performed with the goal in mind of providing a reference to study the relative age of seal stamps further for document examiners.

Seal Stamps, Relative Age, Thin Layer Chromatography (TLC)

438 A Suicidal Note Written Onto the Left forearm and Palm Psychological Autopsy and Differentiation Between Suicide and Homicide

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Psychological autopsy is a rare but very important subject of forensic psychiatry. As a definition it means estimating the origin of death by forensic physicians, forensic pathologists and other forensic scientists.

It is known, that during an investigation of a suspicious death, a collected letter or note may contribute to determine the circumstances of death. Many suicides leave classic notes explaining their reasons for self-destruction and sometimes, in rare cases, writing is found on the wall, furniture's and other impressionable surfaces, like parts of the body.

In a file sent from the court to the 1st Speciality Committee of Council of Forensic Medicine of Turkey, about a case reported dead in a barrage lake written "Nobody is responsible for my death" on her left forearm and palm. The origin of our case being either suicide or homicide is discussed with the evidences in the file and literature findings.

Suicidal Notes, Handwriting, Autopsy

503 The Application of IR Spectrophotometry and Micro-ATR Objective for Toner Examination

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The rapid development of techniques for preparing and copying documents has taken place for years. Investigations proving the association between a document and a specific device used for preparing it are very difficult because they require the joint efforts of criminology experts representing a number of fields. The examinations making it possible to connect a document with the device of its preparation may also be of great importance in many matters, such as the investigation into the revelation of state secrets or anti-terrorist cases.

One of the important attributes making it possible to identify documents is toner chemical composition. Toner composition might easily be determined with the use of infrared spectrophotometry (IR). This method enables unambiguous identification of substances under ex-

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amination and is non-destructive, which makes it possible to continue further physicochemical examination of the same sample. However, obtaining analytical IR spectra from the toner on paper sources is extremely difficult. Thus, the method for collecting toners from paper surfaces has been developed to obtain precise and analytical toner IR spectra.

The thermoplastic properties of the substances contained in toner were utilized in collecting a coating agent sample. The thermal sampling developed in this study enables the sampling of a coating agent in essentially a non-destructive manner. The developed method has numerous advantages:

- Fast coating agent sampling directly from a document.
- Sampling is essentially non-destructive.
- No chemical changes take place during sampling.
- A sample is not contaminated with chemical compounds contained in the medium.
- Direct analysis in a microscope unit of a FTIR spectrophotometer with no additional reagents.
- Sample amount is sufficient to carry out other analyses.

The IR spectra obtained are subjected to a chemometric analysis (cluster analysis). Thanks to the use of numerical and statistical methods, this modern field of expertise makes it possible to reveal associations among individual objects and their appropriate grouping. The chemometric analysis makes it possible to visualize revealed connections and systemize the data obtained. The numerical spectral data processing function makes it possible to build databases of toner IR spectra. The database enables fast analysis and comparisons of a new toner IR spectrum to other spectra. The application of IR spectrophotometry for toner examination provides a fast and non-destructive comparative analysis and group identification of toners used in photocopiers and laser printers.

IR, Toner, Chemometric Analysis

508 EURO Banknote-Genuine or False?

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On the 1st of January 2002, twelve European Union countries adopted a common currency – the Euro. However, not long after the new currency was introduced, fake “Euro” banknotes appeared in Poland (a fake note is shown on the left and a genuine on the right). The differences are very apparent if the original and counterfeit banknotes are compared side by side, which include: paper types that do not withstand multiple folding (no color in the crease); the quality of the ink; and the clarity of the graphics or the color of the hologram. It is proposed that security can be implemented by the following measures:

- specially prepared paper;
- use of specialist printing techniques;
- use of specialist inks and dyes; and
- other techniques

The goal of this presentation is to explain these methods and how to detect the forgeries.

Paper-based security

The traditional and most reliable method to secure banknotes is the use of a specific formula to make paper, which gives it its properties, color and texture, and the application of the watermark. In the case of the Euro, the easily recognizable watermark appears on both sides of the non-printed area and consists of three parts: monotone-positive (denomination value), negative (vertical stripes) and multitone (architectural motif on the font). The euro banknotes contain a security metallic thread, which is embedded into the paper (mirrored microtext), invisible fluorescent fibers that are active in UV light.

The watermark, threads, and fluorescent fibers are printed on the surface of the counterfeit banknotes. Therefore, the watermark appears flat and lacks the depth and detail of a genuine one. All the imitation threads and fibers are active in UV light, which is incorrect.

Special printing techniques

Special printing techniques are used to secure Euro banknotes: intaglio printing, offset, and typography.

Intaglio printing is a technique used for printing graphical motifs. It produces a rich in colour, multi-detailed image that is sharp and clear, yet delicate at the same time. The effect of a silhouette is achieved by using the set of lines and dots. During the intaglio printing process, ink is forcefully transferred onto the paper, creating the relief effect. The printed elements such as denomination value in figures and in letters and other text details are raised and can be easily detected by touch. These tactile properties make it easier for the visually impaired to recognize the banknotes. Intaglio is also used for printing microtext and for optically variable ink.

With counterfeit banknote, the graphics are flat and there is a lack of clarity, definition, tonal variety and microprint. Counterfeit banknotes may be perforated. It is also very hard to replicate the raised printing and to achieve a similar effect.

Another printing technique is offset which is used for printing the background color and the background guilloche on the front and reverse side of the euro banknotes. The guilloche patterns and relief on the false notes are often visible as tiny dots rather than continuous curves and lines. The micro printed text is also missing.

The rainbow effect, i.e. the shifts in color, differs in terms of color and contrast when compared with a forged banknote.

The recto-verso print (part of an image printed on the front-recto and part printed on the back-verso form a complete image – the see-through register feature) was reproduced correctly on the counterfeit note and therefore is not a good security feature anymore.

An interesting technique was used to print the European flag. The yellow stars have a halo visible in UV light, which is caused by superimposing blue and yellow colored inks.

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Letterpress is used for printing an individual number onto a banknote. The print has characteristic thicker edges resulting from a greater ink concentration around the edges of the printed element. On the counterfeit banknote, this thickness effect is missing. Instead, the particles of the toner are visible as a result of the banknote being laser-printed or photocopied.

Special inks

Another security feature is the use of special inks that are not commercially available. Fluorescent inks are used for printing some graphical motifs on the front and the back of the Euro note as well as on the foil hologram. The design elements printed on the counterfeit banknotes differ from the genuine banknotes and show different properties when viewed under the UV light.

The €50, €100, €200, and €500 banknotes contain an optical-variable color element. Depending on the viewing angle, the denomination value in the lower right corner of the reverse side of these four notes may change color. The counterfeit banknotes did not contain this type of ink.

On the reverse side of the €5, €10, and €20 banknotes, a pearly luster stripe has been applied. It varies in color from gray to gold yellow when the note is tilted near a good light source. On the genuine Euro banknotes metameric ink is used. Under normal viewing conditions nothing is apparent, but when viewed under a red filter (infra-red light of 700 – 1000 nm), only a half of the architectural motif appears.

Other security features

The special foil elements vary significantly between small-value and large-value banknotes. On small value banknotes, the foil stripe appears as a hologram on the foil perforation. The foil element is a hologram on the foil perforation of larger valued banknotes. The imitation hologram substantially differs in quality when compared to the original one.

Practically every security feature present on the Euro banknotes was challenged. It is important that these security features are visible and clear enough for the general public to be able to verify whether the banknote is a genuine article.

Euro, Banknote, Forgery

602 The Identification of Chinese Handwriting Characters Written by People Whose Mother Tongue Is Not Chinese

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In the language pedigree of the world, the different languages, such as Chinese, English, Japanese, French, etc., which belong to different families of languages, are used to having a steady and different writing symbol and grammar. Therefore, when the people, whose mother tongue is not Chinese, write Chinese characters, the mother tongue will interfere. The interference has a lesser effect on the higher levels of Chinese writing. However, if Chinese is not the mother language, the effects of the interference will exist and the handwriting must be characteristic of the mother tongue.

Based on the statistical calculation of hundreds of handwritten Chinese characters written by the foreign students in China, this researched studied the difference in writing symbol and grammar between its mother tongue and Chinese. It was found that one characteristic common among Chinese Characters written by those whose mother tongue is not Chinese, but influenced by mother tongue, is regularity. It mainly shows that the mother tongue characteristic exists in individual words, whole overall arrangement, word usage, and sentence pattern. It is possible to discern the different Chinese character written by people of different nationalities according to the mother tongue characteristics.

Identification, Different Nationalities, Chinese Handwriting Character

612 Change of Paper Infrared Spectra at the Beginning of the 21st Century

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Frauds committed in connection with documents are very common. Age estimation of questioned documents is one of the most important aspects of contemporary forensic document examination, but also one of the more difficult problems. The time frame may be several years or a few months. Many forensic scientists have tried to find methods that could be helpful in answering this question. Theoretically, various techniques could be used as well as the examination of a number of objects (such as paper, ink, staples, thread, glue). Available methods are not precise. The infrared and far infrared spectroscopy can be helpful to establish the age of paper but with uncertainty of the order of decades⁽¹⁾.

This presentation refers to a robbery case in which two notebooks with some accounting data were delivered by the accused as a proof of a former debt. The court wanted to know whether it was possible to estimate, even approximately, the age of both notebooks and the ink samples.

It has been found that it is possible to set the age difference of documents from other information. However, investigating the infrared spectra of papers in question and spectra taken as a reference, a very "drastic" change in the vicinity of year 2001 has been found. For older papers a pronounced transmission window around 1500 cm⁻¹ has been observed. The absorption band around 1650 cm⁻¹ is also used to study the accelerated ageing of paper⁽²⁾. The window and the absorption disappeared in the spectra of paper produced after 2001.

Questioned Documents

For these "new" paper, the study revealed additional absorption lines at 100 cm⁻¹, 730 cm⁻¹, 870 cm⁻¹, 1800 cm⁻¹, 2500 cm⁻¹, but the set of absorption lines between 3620 – 3700 cm⁻¹ disappeared. These changes can be due to the changes in the production technology of cellulose (whitening without chlorine) and a paper production without acid. Although, the time scale for different countries will be different, investigating the infrared and far-infrared spectra of paper can at least be helpful for establishing the age of paper for material made around the beginning of the XXI century.

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Paper Age, Infrared Spectroscopy, Document Examination

621 The Experimental Research of Charred Documents Restoration

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Charred documents are often met in the field of document inspection. These charred documents are often important material evidence and restoration of charred documents is an effective means of preservation. The Muffle furnace technique was adopted in this experiment for burned newspaper, offset printing paper, writing paper and copy paper. The different types of paper were burned using a 250 ° C to 900 ° C temperature gradient. The charred documents were restored by the method of traditional glass plate fixation, rice paper paste, and transparent tape. However the solid adhesive rod of the traditional starch paste was used to replace the rice paper paste. The various restoration methods for different paper restoration effects were compared and the results demonstrated the feasibility of the new method of restoration .The results of the experiment may provide some clues and evidence to the investigation of cases involving charred documents.

Rice Paper Paste, Glass Plate Fixation, Transparent Tape

588 The Study on the Distribution Pattern of Centerline of Plantar Pressure in Walking

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Age is a sign of physiological structure and movement function, as well as an important characteristic of the human body. Accurate analysis of the age of suspects who made footprints at a crime scene is of great significance to investigation. There are many methods of footprint examination, but the definition of characteristics used is often vague and uncertain. Further research is needed not only in practical observation but also in the description of characteristics. The improvement of footprint examination from subjective inspection to quantitative analysis is an inevitable trend. This study started with human foot anatomy and progressed to the structural features of bare footprints and the formative mechanism of gait characteristics. The footprint reflection of those characteristics and the changing features and rules of the center of foot pressure of people while walking were studied using Footscan Multi-Step Mat System and other equipment.

Forty people from 18 to 50 years of age were selected to walk normally bare foot through a path on the ground with an embedded Footscan mat. Dynamic images and data of plantar pressure were collected and processed with Adobe Photoshop to analyze the centerlines of plantar pressure distribution and changes. The results show that with the increase of age, the centerline of plantar pressure moves slightly outwards in the toe area, and moves toward the second and third metatarsal in the forefoot area with a narrowed down range. In general, the bending of the centerline of the plantar pressure tends to be smooth and its curvature is decreased.

Age, Gait Characteristics, Center of Pressure

589 The Testing of the Reliability of Gait Impression Theory Through Plantar Pressure Distribution

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Using a Belgium-made gait system plantar pressure distribution and the motion of the foot while walking at normal speed was quantitatively investigated. Pressure data of 154 healthy males walking bare foot on the sensor plate, were statistically analyzed using theories of sports physiology, sports biomechanics, and traditional gait impression theory. Experiments were carried out to quantitatively investigate the process of the unrolling of the foot and the motion of the foot during the formation of gait impression to test traditional gait impression theory. Finally the investigators formulated a modified gait impression theory, discuss the reliability and the value of the gait impression, and provide some reference for the identification method of gait impression and for the further development of gait impression theory.

Plantar Pressure Distribution, Gait Impression, Reliability

323 The Historic and Realistic Significance of "The Washing Away of Wrongs"

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The Washing Away of Wrongs written by Song Ci (1186-1249) has been recognized by Chinese and foreign scholars as the first systematic book of forensic medicine in the world. This predates by about 350 years the European monograph of forensic medicine *De Relationbus Medicorum* published by Professor Fortunato Fedle of the Palermo University in Italy. As a required book of forensic medicine in ancient times in China, "The Washing Away of Wrongs" was translated into 39 editions, 21 of which have spread to Asia, Europe, and America. The book involved many aspects of modern legal medicine and included the law and regulations on the case examination and professional ethics. It not only recorded cases and the methods and points for the examination of cadavers, but also expounded the principle and experience of examination.

The Washing Away of Wrongs has an important place in the history of forensic medicine in both China and the world. It recorded and described ancient cases, methods, and experiences of examining cadavers, and reflected the levels of forensic medicine, sciences and technology, and social development during the corresponding period. The book is an important historic document to study the examination of cases and law at that time. The book summarized and formed professional principles of forensic medicine, which guided and affected medicolegal work in the past time and to the present.

The medicolegal specifications and the laws, rules and regulations on examination recorded in this book are of practical significance to Chinese criminal legislation and reform of the judicial expertise system. The detailed regulation and examination procedures of medicolegal work is of reference valuable to present work, especially in guiding to draft and perform "The law of forensic medicine" in China. To review the professional specifications and the punish stipulations to examination officers who was malfeasance, misfeasance and who take bribes and bend the law is of important practical significance for our medicolegal workers to do well on the work of examination and expertise. Song Ci's serious, conscientious, and meticulous attitude toward forensic medicine, is an example that our later generation should learn. The technologies and methods of cadaver examination are still significant as a reference.

Song Ci, The Washing Away of Wrongs, World Cultural Heritage

371 The Introduction of Forensic Toxicokinetics

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A new subject of forensic toxicology, forensic toxicokinetics, has been proposed in this paper. The research contents include the toxicokinetics, postmortem distribution, postmortem redistribution, postmortem diffusion, and toxic decomposition kinetics of forensic poisons. Through forensic toxicokinetics research, many questions in the medicolegal investigation of poisoning may be answered. These include the concentration of poison in the decedent prior to or at the time of death, distinguishing antemortem from postmortem administration, and the time and route of administration of compounds.

Forensic Toxicology, Forensic Toxicokinetics, Forensic Poison

248 Study on the Elimination Rate of Blood Alcohol and Estimation of Blood Alcohol Concentration for the Chinese Population

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Alcohol analysis is frequently performed on blood samples taken several hours after a traffic accident. In this situation, a forensic scientist is sometimes asked to estimate the blood alcohol concentration (BAC) at the time of driving, rather than at the time that the test sample was obtained. This presentation focuses on the elimination rate of blood alcohol for the Chinese population and estimation of BAC at time of driving, using the measured BAC as a foundation.

A total of 327 (227 males and 100 females) Chinese subjects were involved in drinking experiments. Wine was consumed for a period of 0.5h, together with a variety of food according to the local habit. Other factors such as gender, age, and other physiological conditions were taken into account. BAC peak concentrations were attained within two hours of the cessation of drinking. The experiments showed that elimination of blood alcohol concentration conformed with the model of linear elimination. The linear correlated coefficient r^2 of blood alcohol concentration was 0.985 ± 0.019 . The average elimination rate of blood alcohol concentration was 0.1358 ± 0.0371 mg/ (mL·h) for 327 subjects, and 0.1495 ± 0.0403 mg/ (mL·h) for women and 0.1298 ± 0.0339 mg/ (mL·h) for men. Accordingly, a conservative elimination rate [0.10 mg/ (mL·h)] is suggested for use when estimating BAC at the time of the underlying incident.

Blood Alcohol Concentration, Elimination Rate, Concentration Estimates

400 Study on the Postmortem Redistribution of Lidocaine in Canine Deaths Associated with Anesthetic Accident

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The objectives of this research are (1) to establish the models of postmortem redistribution in dogs with an intravenous, a subarachnoid, or an epidural administration of lidocaine hydrochloride; (2) to compare the distribution of lidocaine in the cardiac blood, peripheral blood, liver, and cerebrum of dogs killed as a result of anesthetic accident, and to provide scientific evidence for the forensic identification of anesthetic accident caused by lidocaine; and (3) to investigate postmortem redistribution of lidocaine in these animals, and discuss its mechanism.

Twenty-seven dogs were randomly allocated to one of three groups (n= nine per group). Six dogs in each group were given either an intravenous injection, a subarachnoid infusion, or an epidural infusion of lidocaine HCl over a ten minute period, at a dose of 5×15 mg/kg body weight. The other three dogs in each group were given the same volume of physiological salt solution (n= three per group). Vital signs such as heart rate, blood pressure, and respiration of dogs were recorded from the beginning of the administration until the time of death. After anesthetic death, dogs were maintained at room temperature throughout the remainder of the study. Cardiac blood, peripheral blood, liver, and cerebrum were collected at 0, 1, 4, 8, 24, 48, and 72 hours after the death. Samples were extracted by ether. Analysis was performed with a GC equipped with a NPD and a GC-MS. Qualitative analysis was based on retention time in the chromatographic system coupled with the ion fragmentation spectrum in the mass spectrometer. Quantitative analysis was based on an internal standard method.

Myotic pupil, respiratory depression, opisthotonos, urinary and fecal incontinence, and sensory paralysis occurred at one to two minutes after the intravenous administration of lidocaine. The symptoms of subarachnoid anesthesia and epidural anesthesia were similar to intravenous administration. Animals showed changes in lidocaine concentration in cardiac blood, peripheral blood, liver, and cerebrum after each route of administration, with the most remarkable change occurring in the cardiac blood. Postmortem cardiac blood lidocaine concentrations decreased from 123.5 ± 0.5 µg/ml to 32.1 ± 0.2 µg/ml 72h after death due to intravenous administration. There was no significant difference between the antemortem and postmortem lidocaine concentration for eight hours in peripheral blood, liver, and

cerebrum. In the 48 h samples, the cardiac blood lidocaine concentration in animals receiving subarachnoid administration was the highest. There were no significant changes of peripheral blood or liver lidocaine concentration in these animals. Liver and cerebrum lidocaine levels were more stable than cardiac and peripheral blood in epidural anesthesia. Peripheral blood lidocaine concentrations were similar to cardiac blood.

The study has established the postmortem redistribution models of intravenous administration, subarachnoid anesthesia, and epidural anesthesia with lidocaine. Marked differences between heart and femoral blood, liver and cerebrum lidocaine concentrations were observed with each model. Postmortem redistribution should be considered when evaluating lidocaine levels in cases of possible anesthetic accident. The chosen site and time of sampling can greatly influence the concentration of lidocaine measured. The data on postmortem redistribution in after intravenous, subarachnoid, and epidural administration in dogs may apply to the study on forensic identification.

Lidocaine, Postmortem Redistribution, Anesthetic Accident

471 Why Do We Need Environmental Toxicology Studies?

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Environmental toxins are one of the most important problems for developing countries. The new and rapidly progressing field of "Environmental Toxicology" has emerged, and is concerned with the harmful effects of chemical, physical and biological agents on living organisms, including fish, plants, animals and humans.

Polychlorinated biphenyls (PCBs) have been accepted as one of the major health risk factors for humans. PCBs are listed in the United States National Priorities List because of their extensive industrial use and chemical stability in the environment, as well as their bio-accumulation in biota. PCBs are highly lipophilic and resistant to biological decomposition, and they easily accumulate in the food chain and in biological tissues. According to the Department of Health and Human Services, Centers for Disease Control and Prevention, heavily chlorinated PCBs are detectable in the serum of 80% or more of the American population. Furthermore, fetal exposure of PCBs from mother to fetus and from mother's milk to the newborn may cause serious neurological, cognitive, and behavioral abnormalities in mammals.

Exposure to PCBs in the polluted environment has been found to be associated with lower birth weight, as well as carcinogenic and teratogenic effects in human. A recent study has also shown the association between fetal exposure to PCBs and impaired immune responses to childhood vaccinations.

Under these conditions, the question for forensic pathologists and toxicologists is: "If the case is related to environmental toxins such as PCBs, should the insurance companies cover the expenses?" Also, "What are the responsibilities of the governments, city councils, food and agricultural departments?"

Polychlorinated Biphenyls, Environmental Toxicology, Forensic Autopsies

511 Importance of Hair Analysis for Cukurova Region

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All over the world, as well as in Turkey, drug addiction has been threatening the economical and social structures of society. The Cukurova region is located in a key point which forms a bridge between Europe and Asia, and is therefore the centre of illegal drug use and trade.

There are several ways to detect the use of illegal drugs. When blood and urine are no longer expected to contain a particular contaminant, hair analysis is one of the most effective tools in forensic toxicology for retrospective purposes. Hair analysis is used for the detection of many therapeutic drugs and recreational drugs, including cocaine, heroin, benzodiazepines, and amphetamines.

It has been reliably used to determine compliance with therapeutic drug regimes, or to check the accuracy of a witness statement that an illicit drug has not been taken. Hair testing is an increasingly common method of assessment in substance misuse in EU nations. However, in Turkey, particularly in the Cukurova region, hair analysis has not yet received the importance it has deserved. In this study, the authors aim to call attention to the importance of the use of hair analysis in this region, and also in Turkey, in the detection of drug use in the EU and world standards.

Hair Analyses, Forensic Toxicology, Drug Abuses

526 Implications of Oral Fluid Testing in DUI Cases

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Oral fluid testing is a relatively new method for evaluating drug-related impairment in drivers. It is generally seen as a non-invasive specimen, which is ideal for roadside collection by police officers. Drugs found in oral fluid reflect recent use and bioactivity, whereas drugs present in urine have much higher negative cutoff levels that do not necessarily correlate with pharmacologically-relevant levels. Currently, SAMHSA provides cutoff concentrations for commonly abused drugs found in the workplace, which can be easily applied to safety in transportation. Since this type of matrix is an uncomplicated liquid phase, it is readily amenable to immunoassays, headspace GC, and LC-MS/MS analyses without a complicated drug extraction. Furthermore, proficiency tests are now available for laboratory certification in oral fluid testing. These factors place oral fluid as a comparable choice to blood for determining toxicological impairment, and as a preferred choice for specimen collection and analysis.

DUI, Saliva, LC-MS/MS

232 LC-MS-MS Analysis of Aconite Alkaloids in a Fatal Poisoning Case

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Aconites are the dried rootstocks of Aconitum plants sometimes used for treating rheumatic diseases in traditional Chinese medicine. Their therapeutic dose nearly equals to toxic or lethal doses so that some people were poisoned because of mistaking or overdose taking. In forensic science practice, many cases by aconite poisonings are usually happen. In this paper, a fatal case is presented involving a 56-year-old man (174cm, 75kg), who ingested about 7mL of Chinese herbal medicinal wine at home and died of aconite intoxication about 2h after ingestion.

Aconite contains many aconitum alkaloids such as aconitine, mesaconitine, and hyaconitine. Here a new method was established for the simultaneous analyses of aconitum alkaloids in biological fluid and tissue, using LC-MS/MS. The method was applied to determination of aconitum alkaloids in samples collected from the autopsy with aconite poisoning. Simultaneously, distribution of aconitine, mesaconitine, and hyaconitine in the autopsy was reported.

The autopsy samples were extracted by combination of 0.5mL of body fluid or 0.5g of tissue, 20ng of internal standard (buprenorphine), 1mL of brate salt buffer solution (pH 9.2) and 3 mL of ethyl ether. Mixing, separation of the organic layer, evaporation at 60°C in a water bath was followed by reconstitution with 100mL of mobile phase solution. Five mL of the extract was injected for analysis on an API 4000 LC-MS/MS system equipped with a C18 - Capcell Pak column with a mobile phase consisting of 20 mmol/L ammonium acetate and 0.1% formic acid (pH 4) / acetonitrile (30/70) in a flow rate of 0.2mL/min. The aconitum alkaloids were identified from extracts by LC-MS/MS with multiple reactions monitoring (MRM), using positive mode electrospray ionization. Aconitine, mesaconitine, hyaconitine, and the internal standard buprenorphine were quantitated by monitoring the ion transition of m/z 646.4→586.1, m/z 632.3→572.2, m/z 616.4→556.2, and m/z 468.1/396.0, respectively.

The concentrations of aconitine, mesaconitine and hyaconitine were found: 49.0, 0.7 and 2.1 ng/mL in heart blood, 763.0, 19.5 and 34.1 ng/mL in urine, 231.0, 25.0 and 4.3 ng/mL in bile, 199.0, 4.5 and 8.7 ng/mL in gastric contents, 465.0, 15.0 and 20.4 µg/mL in wine. The other specimen types were also analyzed including pancreas, heart, small intestine, liver, kidney, stomach, lung, gallbladder, and spleen. The concentrations of aconitine, mesaconitine, and hyaconitine were levels of 4.7-27.5 ng/g, 0.03-0.36 ng/g and 0.16-0.65 ng/g, respectively. The concentration of aconitum alkaloids in fluid and tissue was in the decreased sequence of urine, gastric contents, bile, heart blood, pancreas, heart, small intestine, stomach, kidney, liver, lung, gallbladder, and spleen.

In this case, two facts were revealed. First, the highest values of the aconitum alkaloids were demonstrated in the urine, suggesting the urine was the first choice for aconite poisoning analysis. Secondly, the concentrations of mesaconitine and hyaconitine were far less than the concentration of aconitine in biological samples or in wine and the concentration ratio values of aconitine to mesaconitine or hyaconitine were very near between the biological samples and the wine, suggesting the absorption and distribution of mesaconitine or hyaconitine were similar to aconitine in vivo. Based on LC-MS-MS results and available literature data on aconitum alkaloids poisonings, as well as details of the case, it was concluded that the death was due to an intoxication caused by overdose of aconitum alkaloids.

Aconitine Alkaloids, Intoxication, LC-MS-MS

364 Multi Target Screening for >600 Drugs by Qtrap LC-MS-MS and Library Searching

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The objective of this research is to develop and apply a drug screening procedure with LC-MS/MS for general unknown screening.

A library with ESI MS/MS spectra of 1,250 compounds has been developed using a QTrap 3200 tandem-mass spectrometer (Applied Biosystems) with a turboionspray source.

After standardization of a chromatographic system using a 50 mm x 2.1 mm Allure PFP column (Restek), the library has been used for the identification of drugs and metabolites in urine and serum samples using a "multi target" general-unknown screening approach. Retention times of 760 compounds have been determined and transitions for each compound were selected by a "scheduled" survey-MRM scan, followed by an information dependent acquisition (IDA) using the sensitive enhanced product ion scan of the Qtrap hybrid instrument. A library search was performed for compound identification. Due to the selection of MRM transitions, the method is called Multi Target Screening, covering more than 600 compounds in a single LC-run (drugs of abuse, psychoactive drugs and many others). Automation of data exploration has been performed.

Standardization of the procedure has been performed for its applicability in different laboratories, using a reference standard test mixture ("Suitability Test Mix"), and also internal deuterated standards for semiquantitative analysis for several drugs. First applications of this procedure have been developed for the detection and identification of drugs of abuse and drugs for substitution (opiates, amphetamines, cocaine, LSD, cannabinoids, buprenorphine, methadone), psychopharmaceuticals (benzodiazepines, hypnotics, antidepressants, neuroleptics), and pain relief drugs. Urine samples of drug abusers, from clinical and forensic cases (material from autopsy) have been investigated, with the aim of testing the reproducibility and robustness of the system, especially in terms of comparison of different sample preparation procedures (dilution, extraction) and matrix effects.

With the use of the internal standards, the system could be used for drug identification as it has been demonstrated by GC/MS and HPLC-DAD analysis performed in parallel. Due to an optimized column and gradient for elution with steadily increasing flow rate at the end of the analytical run, a great variety of compounds was detectable in a retention time window of 17 min – in many cases, even at lower concentrations than detectable by classical immunoassays.

The application of this screening method is in clinical toxicology (for target analysis in intoxication cases), in psychiatry (antidepressants and other psychoactive drugs), in forensic toxicology (drugs and driving, workplace drug testing, oral fluid analysis, drug facilitated sexual assault) – whenever a huge number of different drugs are relevant. Further challenges are the automation by on-line extraction for plasma or oral fluid samples.

ESI MS-MS, General Unknown Screening, MS MS Library

11 Research on Breath and Blood Alcohol Concentration of Korean People Drinking

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There are numerous conditions to be considered to presume the alcohol level in the human system. Knowing where, when and how the individual drank and knowing the physical and mental condition of the individual will influence the speed of drinking. You can also analyze the volume of alcohol from blood, urine, sweat, saliva, breath, organs and skin, however, the most reliable way is using the gas chromatography head space method to analyze the concentration of alcohol in blood. Unfortunately, withdrawing blood can be a hassle time wise and economically as well. Another reliable way to analyze alcohol level is through a field test using a breathalyzer that is widely used as a complementary selection. In the case of the breath test method, the ratio of alcohol concentration in the blood relies on blood-to-air partition ratio. Each country's average partition ratio is acknowledged as 1900~2300 and is used as a standard ratio for the breathalyzer. One hundred and five Koreans were tested through a three round test to measure the alcohol concentration in blood through the headspace gas chromatography method and through the lion alcolmeter SD-400.

The breath and blood alcohol concentration among various Korean drinking subjects were examined. After examining the appropriate ratio of the two, the research showed the reason of error of alcolmeter by examining variations of alcohol concentration by the time elapsed.

Through research, the ratio 1900 to 2400 variance was shown in not only the U.S. but also the other foreign countries apply the ratio of 2100 to 1. The experiment reveals that the type and the volume of alcohol, the appetizer choice, and the analysis time after drinking are the conditions that can affect the measurements of both blood alcohol and breath alcohol concentrations.

Characteristic # of subjects	Age (yrs)		Body Weight (kg)		Body Fat (%)			
	Male	Female	Male	Female	Male	Female		
Experiment #								
1st (48persons)	24	24	37.1 ± 9.0	38.1 ± 10.5	73.7 ± 9.1	54.9 ± 6.1	22.1 ± 3.7	25.7 ± 4.4
2nd (27persons)	14	13	42.3 ± 13.2	38.1 ± 10.5	75.7 ± 13.8	57.1 ± 6.1	22.8 ± 4.2	27.9 ± 4.0
3rd (48persons)	15	15	27.5 ± 3.8	38.1 ± 10.5	73.5 ± 9.5	54.1 ± 5.3	22.9 ± 4.0	26.5 ± 3.6

Alcohol, Blood Concentration, Breath Concentration

50 Deaths From Methadone Use Among Teenagers in Maryland During a Sixteen-Year Period

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Methadone maintenance treatment (MMT) for opioid dependency has consistently shown important health, social and legal benefits. At present, MMT is recognized as one of the most satisfactory forms of treatment of heroin addiction. However, recent reports have suggested increases in deaths from methadone use in several locations in the USA and in Europe. In society, deaths from methadone overdose due to ingestion by non-tolerant individuals outside of treatment represent an important issue of public safety.

The Office of the Chief Medical Examiner (OCME) has recorded a significant increase in the deaths from methadone use among teenagers in Maryland since 2001. This study focuses on the trend and characteristics of methadone-induced deaths among teenagers in the State of Maryland by the OCME during the years 1991- 2006.

A retrospective study of Maryland OCME cases, over a 16-year period between 1991 and 2006, yielded a total of 149 deaths caused by drugs of abuse among teenagers age 13 – 19 years in Maryland. Of the 149 drug abuse deaths during this period, there were 25 (16.8%) methadone-induced deaths. Of the 25 methadone-induced deaths, 18 (72%) were due to methadone alone; three (12%) were due to methadone and heroin/morphine; two (8%) were due to methadone and cocaine; and two (8%) were due to methadone and methylenedioxymethamphetamine (MDMA).

Over the sixteen-year study period, the number of drug abuse deaths among teenagers increased sharply in Maryland from six cases in 1991 to 15 cases in 2006, yielding a 150% increase. Narcotic drugs, especially heroin/morphine and methadone played a major role in the rising number of teenager drug abuse deaths. From 1991 to 1998, 22 teenagers died of narcotic drug intoxication. Of the 22 narcotic drug abuse deaths, there was only one (4.5%) death attributed to methadone use. From 1999 to 2006, 74 teenagers died of narcotic drug use. Of the 72 narcotic drug abuse deaths, 24 (33%) were attributed to methadone. The number of methadone-induced deaths among teenagers in Maryland increased significantly from one case between 1991 and 1998 to 24 cases between 1999 and 2006. Abuse of non-prescribed methadone by non-tolerant teenagers was the main contributing factor to the increase.

Maryland is made up of 23 counties and Baltimore City. The majority (76%) of teenager methadone-induced deaths occurred among county residents. White teenagers (84%) were found to be much more frequently involved in methadone-induced deaths than black teenagers. The study also revealed that more male teenagers (76%) died of methadone use than female teenagers.

Methadone, Teenagers, Forensic Toxicology

68 Retrospective Study of Poisoning Deaths in Hubei Province, China

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In China, death caused by poisoning is still a major public health and social problem. This paper presents the retrospective study undertaken to enhance the medicolegal investigation of deaths due to poisoning.

The Department of Forensic Medicine at the Tongji Medical College documented 155 poisoning deaths in the Hubei Province, China from 1999 to 2006. The number of poisoning deaths in Hubei ranged from 16 cases to 28 cases during the eight-year period, with an average of 22 deaths per year. The age distribution of the poisoning deaths ranged from two to 79 years, with the highest incidence in the range of 20-40 years (48%), (mean age = 35 years). More males (63%) died of poisoning than females (37%). The most common mode of poisoning deaths was accident (43.3%), followed by suicide (25.2%). Three cases were homicides (1.9%). The manner of death could not be determined after a thorough investigation of the circumstances of death in 46 (29.7%) victims.

Of the 155 poisoning cases, 41 (26.5%) deaths were the result of rodenticide (tetramine = 37; fluoroacetamide = 4) poisoning, 34 (21.9%) deaths were due to agricultural pesticides poisoning, 27 (17.4) deaths were due to carbon monoxide intoxication, 12 (7.7%) deaths were due to ethanol intoxication, 12 (7.7%) deaths were caused by prescription drugs, 11 (7.1%) deaths involved poisonous animals and

plants, and seven (4.5%) deaths were due to illicit drugs of abuse (methamphetamine = 3, morphine = 1, ketamine = 2, and Dope = 1). There were 11 deaths involving miscellaneous substances, such as caustic/corrosive substances, heavy metals, methanol, and cyanide. The anticholinesterase insecticides, methamidophos, dimethoate, and malathion, were the primary pesticides involved in the poisoning deaths.

Of the 39 suicide victims, ten people (25%) ingested pesticide and nine deaths (23%) were caused by ingestion of tetramine. Of the three homicide victims, two people were killed by tetramine poisoning and one died of pesticide poisoning. The majority of accidental poisoning death was due to carbon monoxide intoxication (22%), followed by poisonous animals and plants (15%), and alcohol intoxication (15%).

The study shows that poisoning deaths due to rodenticide and pesticides remain a major public health problem in China. Although the numbers of tetramine poisoning cases in China have decreased in the recent years since the use of tetramine has been severely restricted by the Chinese government, tetramine is still readily available in China. There is an urgent need to develop an education program on primary prevention in China.

Poisoning, Rodenticide, Medicolegal Investigation

76 Effects of Opium Addiction on Some Serum Factors of Alloxan-Induced Diabetic Rats

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This study was carried out to determine the effect of opium on the biochemical parameters in addicted rats. Traditional opium was given orally (10mg / kg BW) to all experimental rats, except the control negative (normal health) group, for 30 days.

Diabetes mellitus were induced in adult male albino rats, using intra peritoneal injections of 120 mg / kg BW. Blood glucose, serum insulin, total protein, urea, creatinine, alanine aminotrasferase (ALT), aspartate aminotransferase (AST), triglycerides (TGs), and total cholesterol were measured in the serum of rats. Serum total protein, ALT, and AST were lower compared to non-addicted diabetic rats. Cholesterol and triglycerides tend to be lower in diabetic addicted rats. Creatinine and urea in addicted diabetic rats were higher compared to non-addicted diabetic rats. According to our results, opium increases serum insulin and decreases serum glucose, but non-significantly, and thus adds to metabolic disorders in diabetic rats. These results suggest that opium reduces blood glucose in diabetic rats and the mechanism of this effect is unclear.

Alloxan, Diabetes, Blood Glucose

92 Extraction and Identification of Aldicarb (Temik) From Postmortem Tissues Samples

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Aldicarb is a potent inhibitor of cholinesterase and has a high acute toxicity. This means that it acts as a nerve poison by disrupting nerve impulses. In this submitted work, the extraction and identification of temik in stomach content from autopsy cases. The analytical protocol includes grinding these tissues with dichloromethane at PH 5.7. The reaction products was tested by T.L.C on silica gel pre-coated plates and dichloromethane : ethyl acetate : chloroform (65 : 25 : 10) mobile phase, a violet spots are formed after irradiation by U.V. light. Also, colored spots appear when sprayed by Dragen droff or furfural reagents. This was the method has been confirmed by sharp peak by HPLC measurement.

Temik, Tissue Sample, TLC

173 Stability of Incorporated Drug Analytes Within Hair in a Soft Tissue Decomposition Environment

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In forensic toxicological investigations, some period of time may pass between the death and discovery of a body. With the onset of soft tissue decomposition, in many instances the only remaining matrix available for analysis is hair. The aim of this study was to investigate the influence of soft tissue decomposition on drug concentrations incorporated in hair antemortem. Using an animal model, rats were chronically dosed with oxycodone, euthanized, and buried in controlled laboratory microcosms. Oxycodone is a semisynthetic opioid that is related to codeine and morphine with high addiction potential. Soil was standardized for water content and temperature with minimal

exposure to light to control for microbial activity. Measurements of oxycodone and its metabolites incorporated within rat hair were conducted before, during, and after the decomposition process by sequential destructive harvests after burial. Samples were analyzed and quantified by capillary electrophoresis-electrospray ionization-mass spectrometry (CE-ESI-MS). Drug levels in liver and soil were also measured to determine the distribution relationship and stability of analytes. The identification of drug metabolites in hair following post-mortem decomposition has a major application to forensic science. If the rate of disappearance of incorporated drugs in hair shaft can be determined in relation to the mode in which the body is discovered, it may be possible to use this as a determination of the interval between death and body discovery. Results will be presented and discussed in relation to the effects of decomposition on postmortem drug concentrations in hair. Future research will also be highlighted which aims to investigate this phenomenon in a realistic, outdoor environment.

Hair, Oxycodone, Decomposition

180 Suicide by the Inhalation of Automobile Exhaust Gas - Is the Cause of Death Carbon Monoxide Intoxication?

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Recently, the number of suicides by the inhalation of automobile exhaust gas has been decreasing. One of the reasons for this phenomenon seems to be that the carbon monoxide (CO) content in automobile exhaust has decreased due to technical improvements in catalytic converters. Two autopsy cases of the suicidal inhalation of automobile exhaust were studied, where the victims died after attaching a tube from tail pipe to the inside of their automobile. Surprisingly, the blood carboxyhemoglobin (COHb) saturation levels in both cases were not found to be lethal. Case one: A 63-year-old male was found dead in the driver's seat of his station wagon. His blood COHb level was 3.5%. Case two: A 26-year-old female was found dead in her small car and her COHb level was 34.5%. The concentrations of CO, carbon dioxide (CO₂), and oxygen (O₂) were measured in both cars for 90 minutes after faithfully reconstructing the death situation of these two cases. In case one, CO was not detected until 28 minutes later and thereafter it slightly increased with a peak of nine ppm. The O₂ level rapidly decreased to 9.5% (at 20 min), and thereafter remained constant at 4%. The CO₂ concentration gradually increased and reached a constant level at approximately 12%. In case two, the CO level slowly but steadily increased up to 5100 ppm. The O₂ concentration slowly decreased to a level of 9.8%. The CO₂ concentration increased to 10.9%. In case one, death was attributed not to CO intoxication, but to asphyxia and CO₂ intoxication. In case two, death was mainly attributed to CO intoxication and concomitantly to CO₂ intoxication with a depletion of O₂. Hypoxia has been reported to increase the toxicity of both CO and CO₂. In exhaust-gas suicides using automobiles equipped with catalytic converters, the CO concentrations inside the automobiles do not reach a lethal level within a short time. Therefore, the effects of exhaust-gas ingredients beside CO, such as CO₂, O₂, etc., should be considered.

Automobile Exhaust, Suicide, Carbon Monoxide

189 Toxicoepidemiology of Fatal Poisoning in Southern India

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Background: Acute poisoning is a serious global problem and leading cause of morbidity and mortality worldwide. More than 90% of fatal poisonings occur in developing countries, particularly amongst agricultural workers.

Aims & Objectives: The study is done with an aim to describe toxicoepidemiology of fatal poisoning in the region so that people at risk are identified and probable preventive measures can be suggested and taken up accordingly.

Materials & Methods: An autopsy based retrospective review was carried out in the Department of Forensic Medicine and Toxicology, Kasturba Medical College, Manipal. A detailed victimologic profile was made based on autopsy records and information furnished by the police in inquest papers. Identification of the poison responsible for the fatal outcome was based on the chemical analysis reports from the Regional Forensic Science Laboratories.

Results: The study included a total of 198 cases of fatal poisoning. A majority of the victims (n= 141, 71.2%) were males, male-female ratio being 2.5:1. The age of the victims ranged from two to 82 years, with peak incidence in the third decade of life, after which a gradual decline was evident. Third to fifth decades were the most affected age groups, together accounting for 67.2% (n=133) of the total poisoning fatalities. The overall age of victims (Mean + S.D) was 38.4 + 15.99 years, 40.29 + 16.37 in males and 32.81 + 13.72 in females. The manner of death was suicidal in 92.9% of the cases. Time of consumption of poison was known in 66.7% cases (n= 132). Of the know cases, 65.9% of these victims (n= 87) consumed poison during the daytime (8am to 8pm). Of the poisoning deaths 58.5% (n= 116) occurred during the first half of the year (January to June). Maximum poisoning fatalities (n=79, 39.9%) were noticed during summers (February to May) and Agrochemical agents were the main culprit with organophosphates alone responsible for 68.7% (n= 136) of the mortalities followed by zinc phosphide, medicinal agents and carbamates.

Conclusion: By virtue of statistical considerations the study concludes that a male in his third decade is most prone to fatal suicidal organophosphate poisoning during daytime in summer months. A number of chemicals, developed for the benefit of humans, are being used as means of self-destruction, which is a cause of concern. India is predominantly an agriculture-based country and the easy availability of agrochemicals facilitates fatal poisoning. Strict implementation and enforcement of laws, greater control in the sale and use of these products, health education and public awareness especially with regard to safety measures, prevention and treatment of depression, stress management and counseling are recommended along with better health care facilities in rural India to prevent poisoning related mortalities.

Poisoning, Organophosphates, Medico-Legal Autopsies

392 Comparative Regression Analysis of Ethanol in a Korean Male Population

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To evaluate the concentration-time profiles of blood and breath ethanol in elimination phase, a controlled drinking study of 50 healthy males was performed. All subjects were classified into three groups considering each subject's alcohol-drinking history (frequency and quantity in the past year). Group A subjects (n=20) consumed 0.5 g ethanol per kilogram of body weight; group B subjects (n=18) consumed 0.8 g; and group C subjects (n=12) consumed 1.0 g in fast state, respectively. Biological specimens of blood and breath were obtained for the experiment from 60 minutes to 6 hours every 30-60 minutes after the alcohol intake. Statistical analysis included all 450 pairs of concurrent blood alcohol concentration (BAC) and breath alcohol concentration (BrAC) values obtained. Concentration-time profiles of alcohol were plotted for each subject and the rate of disappearance of alcohol from blood and breath were determined using linear regression analysis. According to the mean of 20 regression lines of group A subjects, the elimination rates of blood and breath alcohol concentrations are 0.00848 ± 0.000539 (g/dl/hour) and 0.00955 ± 0.001418 (g/dl/hour), respectively. Identical statistics were applied for breath alcohol group B (disappearance rate of BAC in elimination phase = 0.01175 ± 0.000516 (g/dl/hour) and disappearance rate of BrAC = 0.01346 ± 0.000539 (g/dl/hour)) and group C (disappearance rate of BAC in elimination phase = 0.01902 ± 0.001019 (g/dl/hour) and disappearance rate of BrAC = 0.01925 ± 0.001224 (g/dl/hour)). For blood and breath alcohol, the overall regression equation including all subjects was as follows:

- blood alcohol concentration = $0.067 - 0.010465 (\pm 0.000424, \text{g/dl/hour}) \times \text{hour}$; and
- breath alcohol concentration = $0.078 - 0.013461 (\pm 0.000127, \text{g/dl/hour}) \times \text{hour}$

Statistical differences between BAC and BrAC were evaluated by paired-samples t-test. According to the data of all subjects, BAC was significantly higher than BrAC after 2.5 hours of alcohol intake. Therefore, when the breath-alcohol device is used to estimate venous blood-alcohol concentration, the results of BrAC will tend to be low in the elimination stage. The temporal variation between BAC and BrAC exhibited that BrAC reflects concentration of arterial blood rather than venous blood, which was the sample for BAC in this study. For the linear regression between blood and breath alcohol concentration in elimination phase, the relationship between BAC and BrAC was calculated: group A (BAC = $0.00009 + 0.9513 \times \text{BrAC}$), group B (BAC = $0.0031 + 0.928 \times \text{BrAC}$), group C (BAC = $0.0082 + 0.898 \times \text{BrAC}$), and all subjects (BAC = $0.0034 + 0.921 \times \text{BrAC}$). All linear regression analysis showed the high correlation between BAC and BrAC in the elimination phase. Our results suggest that both blood alcohol concentration and breath alcohol concentration-time data can be used to make forward or backward estimation in the elimination phase. Our regression data showed the high square of correlation coefficient, which suggest that BrAC as well as BAC could be served as objective evidence in forensic application.

Alcohol, Concentration, Elimination

411 Determination of Ethyl Glucuronide in Human Blood by LC-MS/MS

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A rapid determination procedure using liquid chromatography–tandem mass spectrometry (LC–MS/MS) has been developed for the determination of ethyl glucuronide (EtG) in human blood. The internal standard (IS) in this procedure consisted of 100 ng of EtG-d5. The samples were precipitated with acetonitrile, centrifuged and the supernatant analyzed for a determination. The mobile phase utilized was 20 mM ammonium acetate consisting of 1% acetic acid–acetonitrile (10:90, v/v). Detection was based on two daughter ions: transitions m/z 221–85 and 75 and m/z 226–75 for EtG and the IS, respectively. The detection limit was 0.1 µg/ml in human blood. This paper also presents the application of this LC–MS/MS procedure to the analysis of authentic blood samples.

Ethyl Glucuronide, Blood, LC-MS/MS

482 Detection of Sertraline in Fixed Tissues and Formalin Solutions: An Animal Study

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Sertraline is a relatively new antidepressant agent that is also a potent and selective serotonin reuptake inhibitor. Sertraline is widely used in treatments of depression and obsessive-compulsive disorders. However, antidepressants are often misused for suicidal purposes. Forensic toxicology is an important area in identifying the cause and mechanisms of death. It is often difficult to reanalyze the various toxic substances in a certain time period due to the instability of the drugs and reagents as well as the storage conditions for each chemical.

This study aims to investigate the stability of sertraline in various storage conditions as well as different postmortem tissue samples. In this study, sertraline was given to seven Wistar albino male rats in lethal doses by the gavage method and postmortem blood, liver, lung, brain and kidney samples were collected. Some tissue specimens were preserved in 10 percent formalin solutions at room temperature (20 °C) for four weeks before analysis. Other tissue specimens were preserved at -20 °C until just before analysis. Frozen tissues, formalin-fixed tissues, and formalin solutions were analyzed by Gas Chromatography-Mass Spectrometry (GC/MS). Sertraline concentrations in the frozen tissue samples reached a maximum 112 mg/kg in the lung, 84.2 mg/kg in the liver, 67.97 mg/kg in the kidney, and 34.80 mg/kg in the brain. Sertraline concentrations were reduced in fixed tissues and formalin solutions approximately 89 – 99 percent in the tissues mentioned above respectively. It is known that Sertraline converts to the N-methyl derivative in formalin solutions. The study also supported previous studies about this statement. The results indicated that sertraline shows instability even in biological specimens subjected to chemical fixation.

It is suggested that the process of fixing tissues with formalin may lead to false negative findings for sertraline. Perhaps frozen tissue samples should be preferred in cases requiring toxicological analyses. It is suggested to investigate N-Methyl metabolites formalin fixed tissues are found, but nothing else. Therefore, forensic toxicologists should be aware of false positive or negative results, especially where drug related death investigations involved drugs sold commercially in pharmacies

Sertraline, Formalin-Fixed Tissues, GC/MS

13 Forensic Examiner Appraisal Evidence of Traffic Trauma

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The forensic examiner has the responsibility to appraise the traffic trauma case and their conclusion is legal evidence to prove the cause of an accident. Though the evidence of the forensic examiner appraisal possesses the legitimacy, objectivity and related general characteristic, the court still needs to carry on the procedure examination to it for the specialized knowledge. Some cases that are apparent to be the ordinary traffic accident cases are discovered to be vehicular murder cases after the forensic examiner's appraisal.

Social progress has made the automobile output increased at the average annual rate of 24.5% in recent years in China. In 2006, it is estimated that there are 49.85 million cars and the surge in traffic accidents is a cause for serious social concern. The statistics shows 773,000 traffic accidents happened altogether in the whole country in 2002, 109,000 people died and 562,000 injured. The 58th United Nations General Assembly adopted the "Global Road Safety Crisis" draft resolution put forward by 55 countries, including China, in 2003. Through the efforts of government and society, traffic accidents were reduced to 378,000 cases in the whole country in 2006 with 89,000 people dead and 431,000 injured. The case rate of death and injury caused by traffic accidents dropped by 51%, 18.4% and 23.3% separately, compared with 2002.

The forensic examiner is required by law to undertake the task to appraise the cause of death caused by the traffic accident, appraising on the damage intensity, wounded or disabled intensity, labor capacity loss intensity to the wounded, issuing the forensic examiner appraisal conclusion to prove the bilateral accident responsibility and the loss intensity, and offering objective and just evidence of the traffic trauma for the judicial judgment to the case. In addition there are some cases apparent to be the ordinary traffic accidents that are discovered and confirmed to be homicide cases where murder with the traffic vehicle by the forensic examiner. This paper will discuss issues of: 1. Traffic Trauma Mechanics, 2. Forensic examiner appraisal, and 3. Lawcourt examination on coroner's evidence.

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Traffic Trauma, Forensic Examiner Appraisal, Evidence Examination

217 The Injuries Caused by Seat Belts Through the Deformation of the Seats

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The authors investigated a head-on collision between two compact cars in which the driver and the front seat passenger of one car died due to abdominal injuries caused by seat belts. The collision velocities of both cars were estimated to be approx.70km/h each based on the calculation of the energy absorbed by the damage of the cars.

Through the investigation, it was revealed that the front parts of the seat cushions of both front seats of the car had been damaged downwardly. The downward movement of the seats caused the lap belts to slide upwards; this is called "Submarine Phenomenon." The driver and the passenger suffered heavy pressure on their abdomen caused by the seat belts.

In another head-on collision case, the driver's seat was damaged in the same way in the above case, and the driver received severe abdomen injuries.

In the investigation, the strength of the seats of nine passenger cars including two cars of the same type of the crashed cars mentioned above were tested. In the test, researchers applied the load on the front part of the seat cushions using the load tester, and the relations between the loads and damage were obtained.

Through the tests, it was shown that the seat cushions of the cars of the afore mentioned cases were obviously weaker. The seat cushion of the car in the first case yielded at the load of only approx. 2kN(200kgf).

Comparing the new and the old model of the same type car, the strength of the seat cushions of the new models tended to be lower than the old ones in all tested cars. One reason for this could be due to car manufactures attempting to reduce the manufacturing costs. Another reason may be because they haven't recognized the strength of seat cushions as an important factor in crash safety. Seats of passenger cars must have sufficient strength to support the passengers strained by the seat belts who are moved forward in crashes.

Recent reports indicate car bodies are getting stronger and the number of the deaths in traffic accidents is decreasing in Japan. However, based on the findings of traffic accident investigation it is evident that many car parts still need improving.

Investigators of traffic accidents should check whether the seat cushion has been damaged or not in cases where the damage of the front part of the crashed car is severe. When the seat cushion has been damaged obviously, we recommend the injured parties to notify their doctor in order to receive the proper treatment.

Abdominal Injury, Occupant Protection, Cushion Frame

300 Epidemiological Features of the Disabled in Road Traffic Accidents of Shanghai

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Objective: The aims of this study were to provide reference data for enacting and revising the relevant laws and regulations.

Methods: A retrospective analysis was performed of the epidemiological features of the disabilities that were caused by road traffic accidents in Shanghai during 2005 and assessed by medicolegal experts.

Results: The cumulative incidence of disabilities due to traffic injuries was 41.48 cases per 10,000 inhabitants. This incidence was higher among men (50.57/10,000) than women (31.87/10,000). The group aged between 35 and 59 had 3,778 persons who were disabled. It had the highest incidence of disability (53.82/10,000), while the incidence tended to decline with those over the age of 60 (30.2/10,000). The disabilities in the extremities were the most common (3345 or 53.3%), followed by the head (1462 or 23.3%), spine (607 or 9.7%), the thorax (364 or 5.8%), and the abdomen (277 or 4.4%). In the abdominal organs, the spleen was the most commonly injured organ (59.9%), followed by the intestine (13.7%), the kidney (11.2%), the liver (10.1%), and the pancreas (5.1%). The incidence of disabilities as a result of collisions between bicyclists and automobiles (31.9%) was the highest, followed by collisions between pedestrians and automobiles (23.7%).

Conclusion: The prevalence of disability was highest in the age group ranging from 35 to 59 in Shanghai, which correlates with a loss of labor force and a negative effect on economic development. The main causes of the disabilities were crashes between pedestrians or bicyclists and automobiles. Accordingly, it is suggested to enact and/ or revise the existing relevant laws and regulations to avoid traffic accidents effectively.

Trauma, Disability, Traffic Accident

187 Using Information Processing and Accident Reconstruction in Traffic Accident Identification

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Objective: By studying the parameters of traffic accident scenes and their value in the traffic accidents reconstruction, the reconstruction based on these parameters could be more realistic and the accident courses could be visualized. As a result, the progress would enhance the quality of traffic accident analysis and provide important evidence for court. Research on the causes of trauma, accident courses, and their biomechanical responses in traffic accidents could be advanced.

Methods: By collecting fatal traffic accident cases from nine districts in Shanghai from 2003 to 2007 and processing the information of traffic accident scenes such as trails on roads, vehicle surface, human bodies and other trails, it is possible to determine the relationship between the parameters from the scenes and the ones reconstructed. Under the instruction of experts and with the help of crash software such as MADYMO, PC-CRASH AND LS-DYNA, the researchers reconstructed the accidents by using spot trail parameters as well as by using multi-body dynamics and finite element and trajectory optimization. First, 41 models representing people, cars and the streets on which the accidents occurred were made. Additionally, computerized crash researches on different types of cars, different impact speeds and position were performed.

Results: After analyzing different types of trails in 200 traffic accidents, it is possible to draw a conclusion that road surface, vehicle parameters, damaged areas, human gender, stature, and injury situation are essential parameters for the reconstruction. After researches on computerized reconstructions of 41 crashes, it was discovered that skid-marks, human body-vehicle-road relative position, the position of blood trace and objects from vehicle, vehicle performance, vehicle speed, vehicle direction, impact position, impact pattern, scrape-marks, tissue remains on vehicle, cause of death, manner of causing the injury, and injury severity were important parameters in analyzing and adjusting the reconstruction. All these parameters are inter-related and affected each other. In addition, the weather condition, road condition, and human gesture should also be taken into account. In 41 simulations of real crashes, these methods were determined to be safe, repeatable, and obtained at a reasonable cost. In a fixed-condition simulation of crash speeds, types of automobile and impact position were referred to human body's movement and injury situation. If the type of automobile and impacted position were the same, the crash-course would be similar (impact speed \leq 60km/h). Also there were some consistent characteristics in the head acceleration, upper neck axial force, and leg axial force.

Conclusions: Based on the parameters analyzed above on reconstructions with multi-body dynamics, finite element and trajectory optimization methods can be useful in analyzing traffic accidents and these methods are helpful for police and courts in judging traffic accident cases.

Scene Trails, Computer Simulation, Traffic Accident Reconstruction

305 Some Medico-Legal Aspects of Fatal Traffic Accidents in Albania

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The goal of this study was to determine the statistics relating to deadly automobile accidents by collecting data during a ten-year period. The medico-legal approach of collecting data during this study has been similar to other studies of the same nature made in other countries. The deadliest year in terms of automobile crashes was 1994 with 96 occurrences or 14.3% of the total accidents, followed by 1997 and 1998, which had 76 (11.4% of accidents) and 79 (11.8 % of accidents) cases, respectively. Data indicates that 82.9% of the victims were males (553 death cases) and 17.1% of the victims (114 death cases) were females. Most of the victims belonged to the 21-40 age group having 35.2 % of the total death cases, followed by the 41-60 age group with 28.7% of all cases. In 410 death occurrences (61.4 % of accidents), the victims were pedestrians followed by deaths of vehicle occupants and drivers with 104 (15.5% of accidents) and 47 (7.04% of accidents) death occurrences, respectively. Two hundred cases (30% of accidents) appear to have happened in autumn, followed by summer with 182 cases (27.2% of accidents).

From the medico-legal examination, it appears that the most frequent injuries occurred in soft tissues and in the head with 553 and 532 cases, respectively, while limb fractures and torso/abdomen injuries occurred in 261 and 223 cases, respectively. The most common injury mechanism appears to have been vehicle impact followed by striking of the ground in 471 cases or 70.6% of them. Being run over by the tires of the vehicle occurred in 56 cases or 8.48 % of the total cases. The most frequent causes of death have been shock and trauma – hemorrhage occurring in 321 cases or 48.12 % of them, followed by brain contusion with 303 cases or 45.45 % of accidents. In most cases, death appears to have been immediate (during the accident), while in 171 cases or 25.7% of them, the victims were pronounced dead in the hospital hours or days later.

The medico-legal aspects of automobile accidents are also important in determining how the driver's physiological conditions, such as reaction time, whether the driver was under the influence of alcohol, and fatigue or not paying attention, will affect the total number of deadly automobile crashes. Experimental data suggests that visual irritation induces a faster reaction time than hearing irritation. In terms of concentration, it appears that the group of 20 professional drivers made only 2.9 mistakes, while the control group made 4.1 mistakes. In all cases, alcohol lowered the reaction time.

The aforementioned results emphasize the importance of the knowledge that can be obtained from the medico-legal approach of analyzing crash related traumas and the examination of driver reaction time. Such an understanding is an excellent tool for monitoring crashes related to traumas, which can ultimately aid in the reduction and prevention of the vast majority of these types of accidents.

Fatal Automobile Accidents, Medico-Legal Investigation, Trauma

255 Estimation of Bicyclist's Traffic Behavior by Ride and Impact Injuries

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Introductions: Whether a person rides or simply walks with a bicycle results in different traffic behaviors. The former is a bicyclist, whereas the latter is considered a pedestrian. The traffic behaviors, with respect to an accident involving a person on or with a bicycle who collides with a motor vehicle when crossing a road, are quite different. As a result, it is important for an accident judge to determine the traffic behavior of a bicycle holder.

Methods: This study analyzed impact injuries caused by lower limbs contacting the front bumper or apron of vehicles and ride injuries caused by lower limbs contacting the bicycles. After the analysis, the traffic behavior of the bicycle holder could be estimated by these typical injuries. Based on real traffic accident cases of bicycle holders colliding with motor vehicles, the characteristics of impact and ride injuries, as well as their biomechanical mechanisms, were studied. Some factors including information from the scenes, bicycles, motor vehicles, rider wounds, and traffic directions were collected along with the vehicle types. A retrospective method was used to study the locations and frequencies of these impacts and ride injuries. In addition, typical cases were selected to simulate traffic accident courses with computer simulation software. Dynamics data like acceleration, force, and moment were also extracted to compare with those of the real cases.

Results: There were no different frequencies between cases with or without ride injuries nor with those between one-side-collision and front- or back-collision. These results showed that ride injuries are not so easy to be found in bicyclists and the distribution of ride injuries has no relation with the traffic direction. The ride and impact injuries seemed less in large-scale vehicle collision cases than others. The frequency of ride injury manifested with increasing vehicle speed and the ride injury location showed lower in the collision-side leg and higher in the opposite leg.

Conclusion: Analysis of riding injury characteristics in traffic accidents and their biomechanical mechanism would be helpful for the estimation of traffic behavior. It is possible to estimate the traffic behavior of a bicycle holder by the distribution, location, and direction of the impact and ride injuries.

Traffic Behavior, Bicycle, Computer Simulation

Victims of Torture and Genocide

596 Bankart Lesion After Suspension Torture

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Bankart lesion is an avulsion of the joint capsule and labrum from the anterior glenoid rim with or without a bone fragment. This lesion was first described by Bankart (1), and traumatic shoulder dislocations are not rare among torture survivors with a history of suspension torture although most of them are left undiagnosed because of insufficient investigation and documentation during and just after detention period (2). A 37-year-old male had been admitted to the outpatient clinic of the Department of Forensic Medicine, I.U. Istanbul Faculty of Medicine with a history of detention and torture six years prior to his admittance. He had been examined during detention and just after his release, and he had been found physically fit according to those former medicolegal reports. He mentioned about his complaints during the interview of which most prominent was shoulder pain, and restriction of shoulder movements since his detention. His left hand had been fixed with handcuffs on the upper handgrip of a high drawer for seven days, and he had severe pain on his shoulder when he felt tired and had to sit on the floor due to being stretched. He had been referred to an orthopedic surgeon after a thorough examination, and MRI of the left shoulder revealed labral Bankart lesion, chronic posterolateral impaction of humerus, minimum effusion of glenohumeral joint which have been found consistent with anterior shoulder dislocation. He had also been diagnosed to have Posttraumatic Stress Disorder during psychological evaluation, and all his findings had been found to be consistent with torture history six years prior to his admittance. Although it had been mentioned in the former medicolegal reports as "subjective" pain of the left shoulder, dislocation and Bankart lesion had remained undiagnosed for six years.

Reference:

Hill JD, Lovejoy JF Jr, Kelly RA. Combined posterior Bankart lesion and posterior humeral avulsion of the glenohumeral ligaments associated with recurrent posterior shoulder instability. *Arthroscopy*. 2007 Mar;23(3):327.e1-3. Epub 2006 Sep 11

A manual of Effective Investigation and Documentation of Torture, Istanbul Protocol, Training series of United Nations No.8

Torture, Suspension, Bankart

598 Estimation of Wound Age in Falanga Torture

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Assessment of an alleged act of torture as well as consistency of wound age with alleged torture is highly difficult. Either physical injuries might heal without any scar formation, or there might be no injuries at all. A 32-year-old male had been put into prison in February 24, 2001, and he had been subjected to falanga torture after three or 4 days, of which the duration was half an hour for each session, and this method of torture had been repeated for three days. His lawyer took the case to the court, and he had been admitted to the Department of Forensic Medicine in Trakya University School of Medicine on July 13, 2001. During his clinical examination no fresh or old external physical injuries were found on his body. There was no functional restriction of leg joint movements. He had been referred to Radiodiagnostic and Nuclear Medicine for diagnostic tests, and they sequentially performed MRI and conventional three-phase bone scintigraphy. Bone scintigraphy revealed increased blood flow in the left foot and an increased uptake in the left ankle area and left first phalanges of the toes in the blood flow phase as well as the blood pool. On 2 h late static images of bone scintigraphy, there was evidence of an increased osteoblastic activity on both distal tibiae, predominantly on the left side, on the plantar faces of calcaneum, first phalange of the toes and the left proximal fibula. The Department of Forensic Medicine of Trakya University wrote a medicolegal report stating that the subject was diagnosed as having sustained bone trauma. The medicolegal opinion herein was that there was a high probability that this man had experienced a falanga type of torture (1). The case then had been referred to the Council of Forensic Medicine, official forensic institute of Turkey, and their report stated that these findings were consistent with trauma, but the time of trauma could not be known. The lawyer of the case than admitted to the outpatient clinic of the Department of Forensic Medicine, I.U. Istanbul Faculty of Medicine on September 11, 2006, and after discussing effects of repetitive blunt trauma on healing process of soft tissue, it was stated that increased uptake in the blood flow phase as well as the blood pool is consistent with falanga torture three and a half months prior to the diagnostic tests. The lawyer had taken the case to the European Court of Human Rights, and a final decision of compensation had come out in July 2007.

Reference:

Altun G, Durmus-Altun G, Case Report Confirmation of alleged falanga torture by bone scintigraphy—Case report, *Int J Legal Med*. 2003 Dec;117(6):365-6. Epub 2003 Oct 3

Torture, Falanga, Wound Age

Victims of Torture and Genocide

626 Impact of Istanbul Protocol on Improving Documentation of Torture – Sri Lankan Experience

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Documentation of torture for medicolegal purposes is a multidisciplinary, multi-stage, and lengthy exercise decisive in providing reparation. The UN-endorsed Istanbul Protocol contains the first internationally recognized standards and procedures for documenting torture for use as evidence in court.

However, implementation of the Istanbul Protocol can pose dilemmas in less resourced countries. Many medical practitioners are fearful for their safety if they become involved in politically charged cases in highly polarized countries and therefore do not want to investigate, document, and/or give evidence at length. Medical officers need to be specifically trained to identify signs of torture, including psychological symptoms, or refer victims to specialists for detailed examinations.

The International Rehabilitation Council for Torture Victims (IRCT) recently launched a project to promote the use of the Istanbul Protocol in five countries, including Sri Lanka. In 2004, the IRCT conducted a five day joint training for 75 health and legal practitioners nationwide to facilitate closer collaboration in preparing well-qualified reports. The seminar highlighted number of challenges; this paper explores these further and identifies those that resonate across Asia – such as medical ethics, dual role of forensic experts, and the absence of psychological evaluations in forensic reports to courts. A follow up seminar was held in 2007 and regional training seminars were also commenced to promote the use of Istanbul Protocol among non specialist doctors. It will be continued in 2008.

Despite States' obligation to use the Istanbul Protocol as the minimum standard to effectively document alleged torture, it is not adopted as routine clinical (or legal) practice. This paper attempts to identify and examine the causes more extensively.

Torture, Documentation, Istanbul Protocol

509 Investigative and Forensic Approach to Enforced Disappearance in Colombia

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Historically, enforced disappearance has been described as an atrocious State crime committed by the German government and subsequently by Latin American dictators. Recently, this practice has undermined democracies in countries like Colombia, Peru, and Mexico.

The purpose of this paper is to show how this systematic crime and the large number of victims have turned the Colombian territory into an enormous scenario of countless clandestine graves. Immediate action was required to obtain valuable forensic and physical evidence to prove both the crime and its relationship to other atrocious practices, i.e. physical and psychological torture against victims and their families, summary executions, forced recruitment, and forced displacement, before national and international courts.

Colombian forensic scientists and crime scene investigators have been entrusted with a difficult task. Their mission is carried out amidst an armed conflict and under the scrutiny of the international community. This international forensic meeting is a suitable arena to share the lessons learned.

The contribution of international technical cooperation to the accomplishment of the Colombian goal to combat human rights violations through legal instruments will be described. Forensic knowledge and technology have enhanced the weight of the evidence against criminals, many of whom have already been convicted.

Despite its limited resources, Colombia has unexpectedly witnessed increased exhumation and identification processes. Consequently, the country has become a lab that generates a continuous flow of forensic knowledge, due to case complexity, burial timing, body conditions, dismemberment, and limited personal belongings associated to both victims and perpetrators.

Enforced Disappearance, Identification Processes, Non-International Armed Conflict

718 A Global Perspective on Human Rights' Investigation

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Participants will: 1. be presented with a global perspective of different types of human rights violations from torture to genocide; 2. understand the definition of genocide as well as social and political background which lends itself to genocide; and 3. understand the goals of a genocide investigation from a perspective of a field investigator with examples from various human rights mission including the assessment of use of excessive force in occupied West Bank, the destruction of Jenin, Palestinian Refugee Camp, genocide in Bosnia and Rwanda and extreme human rights violations in Iraq and Afghanistan

Human Rights violation is pervasive across the globe, even in countries with seemingly stable and democratically elected governments. Human rights violation includes mistreatment of prisoners, rape as a tool of intimidation and degradation, and physical abuse and torture of political detainees. The ultimate violation is genocide.

Definition of genocide will be presented along with a brief discussion of social and political conditions which result in genocide and other extreme forms of human right violations. Examples will be provided with some details of how investigations are carried out under various conditions including Rwanda, the occupied West Bank, Bosnia in the aftermath of break-up of Yugoslavia, and Afghanistan after the fall of Taliban.

Human Rights, Genocide, Torture

Victims of Torture and Genocide

477 Rwandan Genocide 1994 – A Case Including Crime Scene Investigation, Autopsies, and Clinical Forensic Medicine in 2006

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From April to July 1994, at least 500,000 and maybe between 800,000 and 1,000,000 ethnic Tutsis and thousands of moderate Hutu sympathizers, were killed in the most systematic genocide of modern times. The genocide started April 6 and was carried out in roughly 100 days, mostly by two extremist Hutu militia groups, the Interahamwe and the Impuzamugambi.

In the end of 1996, the government began the genocide trials and in 2001, they began implementing a participatory justice system, known as Gacaca, in order to address the enormous number of cases. Meanwhile, the UN set up the International Criminal Tribunal for Rwanda, based in Arusha, Tanzania. The UN Tribunal has jurisdiction over high level members of the government and armed forces, while Rwanda is responsible for prosecuting lower level leaders and local citizens.

Several persons, suspected by the government in Kigali for taking part in the genocide, are living as refugees in various countries. One of these persons, considered to be a category one Genocide suspect, was discovered to be living in Denmark. Since Denmark has no extradition agreement with Rwanda, the Danish Police started investigating the indictments in 2005.

The specific incident took place in Kigali on April 7, 1994, the second day of the genocide. A Hutu militia group attacked a Tutsi family and their households with machetes and rifles. Of the 26 people involved, 25 were killed and the same day placed in a dry well. The 26th person survived, severely wounded by gunshots.

In spring 2006, the 25 bodies were recovered from the well and placed in a memorial in Kigali. Of the 25 bodies, four were rather good preserved, suggesting possibilities of identification and documentation of the inflicted injuries.

In the summer 2006 a Danish forensic team performed autopsies of the four bodies, a clinical forensic examination of the surviving person and an investigation of the scene of crime.

The results of these examinations will be demonstrated and discussed.

Forensic, Autopsies, Genocide

693 The Role of Forensic Experts in the Prevention of Torture and Inhuman or Degrading Treatments

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The estimation of the minimal level necessary that one treatment be considered degrading is relative and it depends especially on the duration of the treatment, its physical and mental consequences, and sometimes, on the age, sex, and health condition of the individual. In cases of degrading treatment the offended person has the duty to prove the violation, which is difficult to do in many national legislations especially by persons who are in the custody of the authorities and who do not have access to a true independent, medicolegal, expert, total unsubordinated to the state. The importance of medicolegal experts is certified by the fact that this type of expertise is a solid proof of the violation of "Right to life" and "Prohibition of Torture", the most important rights stipulated in the European Convention of Human Rights. The latest feature of the human rights protection system enforced by the European Convention consist in ensuring the perfect equality between the parties- plaintiff and the state that implemented the Convention and presupposes both equality with the Public Ministry and the civil party and the strong possibility to dispute a decisive medical report in order to solve the case or to appoint an expert able to contradict the solutions proposed by the prosecutor's expert. The penal procedural regulations are to protect the accused from the power abuse of the investigating agencies. The defense appears to be the most susceptible to suffer from such regulations, lacunas, and imperfections. The above is also valid in the case of the expert's proposal in the Bonisch case as the claimant could not secure an expert who could contradict the conclusions presented by the expert appointed by the counsel. European Court of Human Rights (ERCH) Article 6 provides a right to fair trial. This right is violated in the case when the accused is not permitted to contest the medical report on which the sentence is based. The evolution of the human rights protection legal system requires the existence of independent medicolegal experts to offset the group of official experts, especially in the case of traumatic injuries or controversial deaths in which state agents are involved. By opening the probation process of the independent medicolegal expert with contradicting evidence equality between the plaintiff and the state can be secured and in this way prevention, combat, and penalty measures become efficient in the fight against the violation of humans' life rights. The difficulty of such an approach is, finding medicolegal expertise in presence of two or more experts. In certain cases, this can result in diametrically opposite opinions. Establishing a new methodological frame is needed. In many categories of expertise the sole solution of application of the arms equality principle is to carry out simultaneous independent investigation, as is the case of DNA, toxicological, or serological expertise. In order to avoid discrimination and comply with the principle of equality of the parties, the countries which signed the Convention should provide certificated medicolegal experts who should use a unitary system of professional standards to offer scientific findings related to the physical or psychic injuries or death of persons. ECHR case law shows the necessity of innovations related to the medicolegal system of expertise, the probatory value of the expertise, and the importance of experts' independence. The evolution of the European Court's jurisprudence prefigures the appearance and development of new judicial models where the evidence medical systems and their contradictorality means will have a decisive role in the judicial assessment of human rights breach stated in Article 2 and Article 3 of the European Convention.

Contradictory Procedure, New Judicial Models, Medical Experts

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