# 2ND INTERNATIONAL FORENSIC SCIENCE SYMPOSIUM

## ADVANCING FORENSIC SCIENCES

### 14 - 16 NOVEMBER 2011

### Le MERIDIEN HOTEL, KUALA LUMPUR

## ABSTRACTS

# Introduction

The 2nd International Forensic Science Symposium was held at Le Meridien Hotel, Kuala Lumpur, Malaysia from 14th to 16th November 2011. The symposium was organized by the Forensic Science Society of Malaysia (FSSM) in collaboration with the Department of Chemistry Malaysia and Ministry of Science, Technology and Innovation Malaysia. The international delegates and local participants gathered and shared information in symposium via oral and poster presentations. The abstracts for oral and poster presentations during the IFSS Symposium are as follows:

## Abstracts for Oral Presentation

1. **Forensic DNA Offender Databases - the Greatest Crime Story Ever Told**

2. **Advancing Forensic Science – Global Cooperation And Networking**

3. **Forensic Science Education and Training**

4. **Strategies for DNA Analysis of Challenging Samples**

5. **DNA-PROKIDS: Fighting Children Trafficking Around the World**

6. **Sample Collection Using FTA Technology – Efficiency, Reproducibility, Reliability and Ease-Of-Use**

7. **Allele Frequencies of mtDNA Single Nucleotide Polymorphism in Random Malay Population of Malaysia**

8. **Forensic Investigations: A look into Automated Sperm Detection System**

9. **Development of Forensic DNA Analysis Software for an Integrated Decision Support System in Crime Investigation**

10. **Assessment of DNA contamination risks in post-mortem samples and Tracking the source: A case report**

11. **Application of X-STRs Analysis in Forensic Casework in Malaysia**

12. **Determination of cathinones and piperazines in urine by UPLC-MS/MS and GC/MS**

13. **Mega Methamphetamine Clandestine Laboratories Found in Malaysia**

14. **A selective and sensitive detection method of O6-MAM in urine using hydrophilic interaction chromatography (HILIC)-MS/MS**

15. **Thermal Stability of Methamphetamine in Urine**

16. **Drug Seizures in Malaysia**

17. **Simultaneous Determination of Inorganic Ions in Post-Blast Residues Using Capillary Electrophoresis**

18. **Identification of fuel oil in absorbent and Non-absorbent surfaces in a site of Ammonium Nitrate-Fuel Oil (ANFO) blast**

19. **The use of Capillary Ion Chromatography for the Forensic Analysis of Inorganic Ions**

## Abstracts for Poster Presentation

# Abstracts for Oral Presentation

## The 2nd International Forensic Science Symposium
## 14th to 16th November 2011
## Hotel Le Meridien, Kuala Lumpur, Malaysia

## Forensic DNA Offender Databases - the Greatest Crime Story Ever Told
### Tim Schellberg

**Abstract:** Forensic DNA offender database are clearly the best crime fighting tool ever developed for law enforcement. Their extraordinary ability to solve crime and exonerate the innocent has caused a monumental shift in the way police and society view criminal investigations, and created a global push to establish database programs in most countries. Behind the success of the databases is a unique story of scientific discovery, entrepreneurialism, political and legal intrigue, and the struggles of crime victims to achieve justice. Tim Schellberg's global DNA database experience allows him to tell the forensic DNA offender database story in a comprehensive manner that will be both informative and entertaining.

## Advancing Forensic Science – Global Cooperation and Networking
### Jose A. Lorente, M.D., Ph.D
*Univesity of Granada, Spain*

**Abstract:** IFSA stands for the International Forensic Strategic Alliance. IFSA is a partnership between the regional networks of operational forensic laboratories including:

- the American Society of Crime Laboratory Directors (ASCLD)
- the European Network of Forensic Science Institutes (ENFSI)
- the Senior Managers of Australian and New Zealand Forensic Laboratories (SMANZFL)
- the Academia Iberoamericana de Criminalística y Estudios Forenses (AICEF)
- the Asian Forensic Sciences Network (AFSN)

Very recently, actually last September 2011m during the annual meeting held in Madeira Island, Portugal, a new member was admitted:

- the Southern Africa Regional Forensic Science Network (SARFSN)

The United Nations Office for Drugs and Crime (UNODC) attends all IFSA meeting as an invited observer, having the right to speak in the meetings, and they play a very active and positive role.

These autonomous networks represent forensic science laboratory management for their specific regions. They have similar roles, functions and objectives and recognise the value to be gained through long-term collaboration and cooperation on strategic issues related to the management of forensic science laboratories and the promotion of forensic science. It is recognised that IFSA has no legal status but represents a cooperative entity comprising the member networks.

Vision: to create opportunities for strategic collaboration across the global forensic science community.

Goals and objectives:

- to represent the operational forensic science community
- to develop and execute a rolling agenda for strategic issues related to forensic science
- to be a strategic partner to other relevant international organisations and partnerships
- to encourage the exchange of information related to experience, knowledge and skills between the member networks

All these topics will be described and briefly discussed to show the absolute need of a global, scientific and technical cooperation.

# Forensic Science Education and Training

**Norazmi Mohd Nor**

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**Abstract:** There seems to be a boom in the offerring of Forensic Science Programs throughout the world. Forensic education and training, once offerred as graduate MSc programs designed to elevate the knowledge and skills of those already working in the profession, has now turned into an attractive "cool" undergraduate program to pursue. The shift in interest for forensic education was greatly promoted by the news media in highlighting the use of various forensic investigative tools in high profile cases and the fictitious forensics-related drama that fills our entertainment media. These exposures have created public demand for the use of more forensic investigative tools in solving crimes and the surge in interest among high school leavers to become forensic practitioners. As a consequence, forensic undergraduate programs have mushroomed in many countries with little concern on the relevance and quality of the academic programs offerred. This paper expounds on my personal view of how the forensic education and training has evolved in the last decade with specific reference to the situation in Malaysia.

# Strategies for DNA Analysis of Challenging Samples

**Jose A. Lorente, M.D., Ph.D.**

*DNA-PROKIDS Director, Univesity of Granada, Spain*

**Abstract:** Human Identification has made great strides over the past two decades due to the advent of DNA typing. Forensic DNA typing provides genetic data from a variety of materials and individuals and is applied to many important issues that confront society. Part of the success of DNA typing is the generation of DNA databases to help identify missing persons and to develop investigative leads to assist law enforcement. DNA databases house DNA profiles from convicted felons (and in some jurisdictions arrestees), forensic evidence, human remains, and direct and family reference samples of missing persons. These databases are essential tools and the tools are becoming quite large (for example the US Database contains 10 million profiles). The scientific, government and private communities continue to work together to standardize genetic markers for more effective worldwide data sharing, to develop and validate robust DNA typing kits that contain the reagents necessary to type core identity genetic markers, to develop technologies that facilitate a number of the analytical processes, and to develop policies to make human identity testing more effective. Indeed, DNA typing is integral to resolving a number serious criminal and civil concerns, such as solving missing persons cases, identifying victims of mass disasters, identifying children that may have been victims of human trafficking, and historical studies. As the demands continue for enhancing capabilities, novel approaches are being sought, such as genetic testing by next generation sequencing, mass spectrometry, chip arrays, and pyrosequencing. New markers known as single nucleotide polymorphisms offer the potential to analyze severely compromised biological samples, to determine the facial phenotype of decomposed human remains, and predict the bioancestry of individuals.

# DNA-PROKIDS: Fighting Children Trafficking Around the World

**Jose A. Lorente, M.D., Ph.D.**

*DNA-PROKIDS Director, Univesity of Granada, Spain*

Children trafficking and exploitation has become one of the main criminal problems throughout the world, and it is rapidly becoming the primary crime in economical terms. DNA analysis can play an important role in verifying alleged kinship relationships. Forensic DNA testing for identification of human remains and routine casework is used throughout the world and a technology that is readily accessible. More than 1 million children are reported as actively "missing", and likely this number is grossly underestimated. Many of these missing children have been separated from their families and are being trafficked for various exploitations. DNA typing of these children and alleged relatives can verify or refute biological relationships that could be extremely useful is securing trafficked and exploited children and assisting law enforcement in identifying traffickers and their networks. Moreover, database of DNA profiles from parents who report missing children and children, e.g., who are offered for adoption or abandoned, will facilitate the identification process on national and international scales. In 2006, the University of Granada (Spain) initiated the DNA-PROKIDS Program, and in 2009 the Center for Human Identification, University of North Texas Health Sciences Center, joined in the program as a primary partner. This program has been able to function by support from the Spanish Government, several large Spanish banks including BBVA, Santander and CajaGranada-BMN, and donations from the Life Technologies Foundation.

There are two databases that are needed to form a functional search capability for child identification. One is a Reference Database (RD) of DNA profiles obtained from biological samples (buccal swabs) voluntarily provided by mothers and other family members of missing children. The other database is a Questioned Database (QD) of DNA profiles obtained

from children that have been found without their families, are being exploited, or are known to be victims of human trafficking. Each country that has agreed to be part of the DNA-PROKIDS network maintains its own RD and QD. The DNA profiles are searched within and between a country's databases in an effort to identify missing children within the country. International sharing is performed on a case-by-case basis and currently is a manual process. DNA-PROKIDS has partnered so far with and supported the development of such DNA databases in six countries within Latin America and within four countries in Asia.

To date, over 3.000 have been collected by the different participating countries, and over 350 positive identifications have been made. In September 2010, Guatemala passed the Alba-Keneth Law that requires mandatory collection and analysis of biological samples from all children found without relatives and offers, by law, all relatives of missing children the opportunity to donate a biological sample for the DNA-PROKIDS Guatemalan database. To the best of our knowledge this is the first law of its kind throughout the world. The database is coordinated in Guatemala through its National Institute of Forensic Sciences.

To continue to identify trafficked and exploited children and to dramatically increase the success that these DNA-PROKID pilots have experienced a greater globally, coordinated effort is needed.

# Sample Collection Using FTA Technology – Efficiency, Reproducibility, Reliability and Ease-Of-Use

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**Abstract:** Sample Collection using FTA technology enables highly reliable sample collection, transport, and archiving as well as the process efficiency and flexibility needed in today's forensic databasing laboratories. FTA's highly reliable sample collection, transport, and archiving system ensures room temperature stabilization of DNA on top of being able to protect sample from environmental factors such as UV exposure. FTA technology is able to increase process efficiency with compatibility to automation configuration and recently has just been validated for use with Direct Amplification chemistries. FTA technology encompasses flexibility to complement DNA extraction kits, FTA wash procedure, and direct amplification chemistries resulting in reproducible STR analysis, sequencing, and real time PCR (quantification of DNA) results.

# Allele Frequencies of mtDNA Single Nucleotide Polymorphism in Random Malay Population of Malaysia

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**Abstract:** Recent studies suggest that Single Nucleotide Polymorphism (SNP) of mitochondrial DNA (mtDNA) are associated with several diseases either they stand alone or link with the other loci involved. We studied on 150 individuals from Malay Population of Malaysia through their mtDNA coding region sequences. The mtDNA sites that involved in this study are 1719, 3010 and 13 708. The aim of this study is to determine the polymorphisms for these particular loci. The individuals are taken randomly. The loci chosen are prone to mutate, and previous study have shown that most of the mutations occurred on these sites. The sequence polymorphisms of these loci were determined by polymerase chain reaction (PCR) and direct sequencing. This study has revealed that the frequencies of these polymorphisms seem to be very rare if not absent, indicating that these three mutations are not likely to be common region mutation in mtDNA. The data did not support our hypothesis that mutation on these loci occurred in most of the Malay Population of Malaysia.

**Keywords:** mitochondrial DNA (mtDNA), polymorphisms, population data, SNPs

# Forensic Investigations: A look into Automated Sperm Detection System

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**Abstract:** The forensic detection of spermatozoa in semen swabs has, primarily, been the best physical evidence for conviction of sexual assault cases. Although practiced routinely, manual microscopy methods of detection are often laborious and time-consuming. This had resulted in major bottlenecks in many forensic laboratories. In recent times, automated sperm detection systems have been gaining traction by offering unprecedented speed and accuracy. The MetaSystems™ Automatic Scanning Platform provides unattended scans of up to 880 slides (slide feeder system) using standard 'Christmas Tree-stained' slides. Besides, brightfield imaging, this versatile system can be adapted to detect fluorescently-labeled human sperms (antibodies from SPERM HY-LITER™). All captured images can be digitally archived and documented as evidence or for future references. Finally, we will discuss issues related to low or near azoospermic scenarios where the automated scanning platform can be coupled seamlessly with the P.A.L.M MicroBeam Laser Microdissection System. Such a procedure shall allow the dissection and isolation of limited materials for further analysis such as DNA profiling.

# Development of Forensic DNA Analysis Software for an Integrated Decision Support System in Crime Investigation

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**Abstract:** Forensic DNA analysis has proven to be reliable by number of crime cases solved internationally. Collaboration between software engineers and forensic scientists has moved to the next level in developed country. Computerized decision support system (DSS) has been applied in a wide range of computer applications in variety fields including forensic science. The aim for this research and development (R&D) is to design a new architecture of an integrated system in handling DNA profile match for identifying possible criminal and convicted offenders. Currently, this proposed forensic DNA analysis software is being developed to help forensic scientists to analyse DNA profiles. The current focus is for short tandem repeat (STR) data analysis, while for future work; mitochondrial DNA (mtDNA) database and analysis shall be included as well.

Royal Malaysian Police (RMP) is currently using Forensic DNA Database System (FDDM) to facilitate forensic DNA analysis in crime investigation. A visit to RMP Forensic Lab has been arranged to initiate Software Development Life Cycle (SDLC) in identifying how current system works, the advantages, and weaknesses including costs issues for further software reengineering. A quick review on current forensic DNA analysis software has been done, including; DNAStat, DNA-View, EasyDNA, EasyPate, familias, GenoProff, Genotype, Hugin, PatCan, Paternity Index and PatPCR. The common lack among these softwares is there is no intelligent visualization of explorative data analysis applied.

Through the observation and interviews with forensic experts and RMP officers, an extensive study has been done on how the whole system works in general. Mechanism of control is introduced to ensure data integrity. Inferences and further forensic mathematics formula will be implemented in proposed software. Finally, the proposed architecture and software will be evaluated by forensic experts and RMP officers themselves.

**Keywords**: Forensic DNA analysis, decision support system (DSS), software reengineering

# Assessment of DNA contamination risks in post-mortem samples and Tracking the source: A case report

**Seah Lay Hong**

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**Abstract:** DNA can be transferred at any time before, during and after a death event. The observation of mixtures in DNA profiles recovered from post mortem samples besides providing investigative leads could also indicate post-event transfer. The potential sources of contamination must be considered before the link to a potential perpetrator. The risks of post-mortem contamination were illustrated in a case report tracking the source of contamination to prior autopsied bodies whose DNA profiles reconstructed from living next-of-kin provided evidence of the transfer.

# Application of X-STRs Analysis in Forensic Casework in Malaysia

**Revathi Perumal**

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**Abstract:** X chromosome is inherited by a female (XX) from both parents while a male (XY) is inheriting the X chromosome from only the mother. This phenomenon creates a diplotype nature to X-short tandem repeats (X-STRs) in females and haplotype nature in males. The X-STRs are particulary informative for inferring kinship as well as paternity disputes thus serves as an additional tool to the conventional autosomal Short Tandem Repeats (STRs). The Mentype ® Argus X-8 kit consist of eight X-STRs is currently being applied in our forensic casework. In Case #1, a woman whose husband died a few years back wanted to prove to the husband's family that her daughter is indeed her husband's biological daughter. As the father's blood is not available for paternity testing using STRs analysis, we requested for the grandmother's blood for X-STRs comparison. Based on the inheritance of the X-chromosome, the grandmother would have passed one set of her X-STRs to the father and the same set would have been inherited by the daughter. The X-STRs analysis showed that the daughter shared one allele in each X-STR with her grandmother, thus confirmed that she is the biological granddaughter. In case #2, Blood specimens of a male and a female were sent to confirm whether they are from the same biological father. For STRs analysis involving kinship, blood specimens of at least three siblings are required. Thus we decided to employ X-STRs analysis for further confirmation. The X-STRs analysis showed that the male is actually a XXY male as his X-STR profile was diploid and the peak imbalance in the Amelogenin gene was apparent with the X peak height doubles the Y peak height. With that situation, we had a chance to analyze four sets of X-STRs instead of three and that gave us a clear view that they had the same biological mother but different biological fathers. As a conclusion, the unique inheritance pattern of the X-STRs is proven to be useful especially in resolving cases where the STRs could not be employed. However, parent-offspring cases involving at least one female such as mother-daughter, mother-son and father-daughter relationship can be positively resolute using the X-STRs even without the STRs analysis. In addition, the maternal lineage can be determined without the application of the mitochondrial DNA analysis which is a hassle and time consuming method.

# Determination of cathinones and piperazines in urine by UPLC-MS/MS and GC/MS

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**Abstract:** In recent years, designer drugs belonging to the classes of beta-keto-amphetamines (e.g. 4-methylmethcathinone, a.k.a. mephedrone) and piperazines (e.g. 1-benzylpiperazine (BZP) and 1-(3-trifluoromethylphenyl)-piperazine (TFMPP)) have gained popularity as attractive alternatives for illicit amphetamines-type recreational drugs worldwide due to their similarity in psychotropic effects. The rise in prevalence in the use of these central nervous system stimulants, compounded with multiple reports of fatalities linked to the abuse of these drugs, has led to increasing control of these synthetic derivatives in many European countries. In Singapore, 4-methylmethcathinone, 1-benzylpiperazine and 1-(3-trifluoromethylphenyl)-piperazine are recently classified as Class A Controlled Drugs in the First Schedule of the Misuse of Drugs Act (MDA), with effect from 15 November 2010. In this presentation, an overview on the properties of these novel drugs will be given. The methods developed for the sensitive determination of cathinone, methcathinone, mephedrone, BZP and TFMPP in urine involve a semi-quantitative screening by UPLC-MS/MS and a qualitative identification by GC-MS. Briefly, the sample preparation involves a liquid-liquid extraction using a pH 12 buffer and 1-chlorobutane extraction solvent. In the screening method using UPLC-ESI-MS/MS, chromatographic separation is achieved in a 10 min runtime via a reversed phase column (Aquity BEH C18 column 100 x 2.1mm id, particle size 1.7 µm), using gradient elution with 10mM ammonium formate (pH 3) and acetonitrile. Semi-quantitative analysis is based on multiple reaction monitoring in the positive mode using an appropriate internal standard (D8-methamphetamine). The qualitative identification by GC-MS was performed under EI full scan (m/z 50-400) conditions and the target analytes are separated with an Agilent HP-5MS 25m x 0.2mm x 0.33µm id capillary column in a 13.5 min runtime. The lower limit of quantitation for the UPLC-MS/MS method is 0.5 ng/mL while the limit of detection for the GC-MS method is 20 ng/mL. The results and challenges faced during the implementation of these two validated methods into routine toxicological testing will also be discussed.

# Mega Methamphetamine Clandestine Laboratories Found in Malaysia

**Maimonah Sulaiman**

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**Abstract:** In the 90's Malaysian drug abusers were introduced to a new kind of drug – ATS: Amphetamine Type Stimulants. With the emergence and rampant abuse of the ATS (in particular, crystalline methamphetamine) from the mid 90's, several large and medium sized clandestine methamphetamine laboratories were discovered in the country since 1998. Since then Malaysia was labeled as one of the methamphetamine producing countries in south-east Asia region. Recently a new trend of clandestine laboratories has been uncovered, involving mini scale production of the drug operated in exclusive apartments and condominiums. Methamphetamine can be synthesized either using ephedrine/pseudoephedrine or Phenyl-2-Propanone (P-2-P) as precursors through various synthesis routes. In this presentation, synthesis routes of producing methamphetamine using these precursors by these methamphetamine clandestine laboratories found in Malaysia will be discussed.

# A selective and sensitive detection method of O6-MAM in urine using hydrophilic interaction chromatography (HILIC)-MS/MS

**Hooi Yan Moy**, GuanHong Dai, Ching Yee Yong, Yi Ju Yao, Chi Pang Lui

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**Abstract:** Diamorphine which is present in the street heroin can be metabolized in the body to $O^6$-monoacetylmorphine ($O^6$-MAM), and then further metabolized to morphine after consumption. Clinical use of morphine and codeine for the treatment of pain and cough, respectively, can also result in morphine being detected in the urine sample. Hence, the presence of $O^6$-MAM in urine has been proposed to be a specific marker for heroin abuse. In a clinical study of urinary excretion patterns of $O^6$-MAM, the concentrations were ranged from 0.8 to 236 ng/ml with a mean urinary half life of 0.6 hour (*1*). Since $O^6$-MAM is present in low concentrations for very short periods of time, the detection of $O^6$-MAM in urine is highly dependent upon a number of factors including dosage, individual rates of metabolism and elimination, method specificity and sensitivity. In the present study, a fast, selective and sensitive method for the quantitative analysis of $O^6$-MAM in urine by the liquid chromatography-tandem mass spectrometry (LC/MS/MS) was developed and validated. A comparison study on the retention and separation of $O^6$-MAM, morphine and codeine (which are commonly found in heroin abusers' urine) by hydrophilic interaction chromatography (HILIC) and the reversed-phase (RP) chromatography is presented. The method comprised a simple liquid-liquid extraction (LLE) with ethyl acetate, followed by analysis using a Waters 2795 liquid chromatography, Quattro Micro triple–quadrupole mass spectrometer. Chromatographic comparison was performed on a Atlantis® HILIC Silica 2.1 x 100 mm (3 µm) column and XTerra® RP18 2.1 x 100 mm (3.5 µm) column using step gradient elution with 10 mM ammonium acetate and acetonitrile. The selectivity and sensitivity of the developed method were evaluated using the real case samples.

# Thermal Stability of Methamphetamine in Urine

**Dickens Wong Vui Foo**

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**Abstract:** A cold room or a refrigerator is commonly used for the preservation of the human body fluid specimens (*e.g.*: blood/urine) in most toxicology laboratories. A cold temperature is essential to retard the microorganism activities and the degradation of toxic substances in the specimens. However, the cold storage facilities may not be available for some of the enforcement officers. The toxicology experts are often challenged by the lawyer in a drug abuse trial concerning the accuracy of the analytical result, in cases where the specimen of the accused was kept at room temperature in the enforcement officer's office, or in a car under the hot weather during the transportation to the toxicology laboratory. This work involves study of the thermal stability of Methamphetamine in urine. The presence of Methamphetamine in the urine specimens were preliminarily identified by Gas Chromatography Mass Spectrometry. The stability of the analytes was evaluated after the various stages of thermal treatment. Analyte concentration in urine after storage of 20 days at room temperature, 10°C and 33-40°C were determined. The thermal stability of analytes before and after the urine specimens were boiled in a water bath, directly heated by flame, autoclaved and refluxed for an eight-hour period were also studied.

# Drug Seizures in Malaysia

## Dr.Vanitha Kunalan

*Section of Narcotics, Division of Forensic, Department of Chemistry, Petaling Jaya*

**Abstract:** The Narcotic Section at the Division of Forensic in Department of Chemistry conducts examination of drug seizures submitted by the Royal Malaysian Police and Custom Department. Recently many cases were related to international crime gangs which involve smuggle or trafficking of drug into Malaysia. This presentation will cover the type of drugs with the method of conceal use to smuggle the drugs in the country. Beside that there has been a sharp increase in the existence of clandestine laboratories in Malaysia. However, since 2009 police have not uncovered large methamphetamine laboratories, but they did seize several smaller clandestine methamphetamine, heroin cutting lab and erimin-5 labs in 2010. Some of the large drug seizures were related to these clandestine laboratories and will be highlighted in this presentation.

# Simultaneous Determination of Inorganic Ions in Post-Blast Residues Using Capillary Electrophoresis

**Nor Laili-Azua Jamari**[1], Umi Kalthom Ahmad[1*], and Sivabalan A/L Nagayah[2*]

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**Abstract:** A capillary electrophoresis method for simultaneous determination of inorganic anions and cations was developed using 2,6-pyridinedicarboxylic acid (PDC) as a background electrolyte (BGE) with indirect UV detection. In order to detect both anions and cations simultaneously, the electromagnetic flow was reversed by adding cetryltrimethylammonium hydroxide (CTAH). The parameters which influence the separation of these inorganic ions such as electrolyte pH, concentration of PDC, applied voltage and temperature were investigated. Four anions ($Cl^-$, $NO_3^-$, $SO_4^{2-}$, $SCN^-$) and three cations($Ca^{2+}$, $Fe^{2+}$, $Fe^{3+}$) were successfully determined simultaneously in less than 7 min under the optimized conditions (25mM PDC, 0.5mM CTAH, pH 4.7). The method was then applied to the analysis of post blast explosive residue of black powder and ammonium nitrate-fuel oil (ANFO). The analytical performances of the method are discussed in terms of migration time, peak area, repeatability, linearity of response and detection limits.

**Keywords:** anions, cations, post-blast residue, capillary electrophoresis

# Identification of fuel oil in absorbent and Non-absorbent surfaces in a site of Ammonium Nitrate-Fuel Oil (ANFO) blast

## T.Nataraja Moorthy, Hidayatul Hazwani bt. Hamdan, Cheah Chaw Phang

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**Abstract:** The investigation of explosion has a long history in forensic science and covers incidents ranging from accidents in the home or workplace to major terrorist attacks. In the scene of an explosion, the forensic scientists try to find out what kind of explosion occurred, the materials involved and so on. When explosive is used illegally and to cause harm, it is generally known as a bomb. Legitimate explosives include fireworks and blasting materials used in quarrying. ANFO remains one of the most commonly used products in quarry blasting. The current trend is the problem of the misuse of certain chemicals, for example, ammonium nitrate etc which are widely available to the general public in the market, as precursors to homemade explosives. There are many instances wherein the quarry explosive is being misused by the perpetrators for criminal activities such as blast fishing, ATM bombings, terrorism and so on. Another form of bombing activities wherein the unskilled perpetrators prepared IEDs with improper weight ratio of ANFO to trigger explosions which caused ineffective explosions that are reflected in the blasting scenes. If the ANFO explosions occur in fertilizer contaminated area such as agricultural fields, AN fertilizer stocking points and frequent AN transport area etc, it is cumbersome to assess the ANFO explosion unless or otherwise fuel oil is detected. The detection of oil residue may indicate the use of ANFO in the blast and the pattern of fuel oil in the basting scene indicate the improper proportion of AN and FO. A blasting research was conducted using ANFO at Tenaga Kimia SDN BHD campus, Batu Arang, Selangor in this regard. The blasting exercises were conducted using AN and FO with varying proportions and studied the presence of fuel oil residue in different types of absorbent and nonabsorbent surfaces and the extent to which the oil residue

travelled from the crater after the blasts. The post blast residues were analysed at JKM, PJ. The improper proportion of AN&FO, after the blast showed some characteristic mark in the crater that may ease the forensic investigation. These findings will be presented orally in the symposium.

**Keywords:** explosion, ANFO, fuel oil detection, fuel oil pattern, distance travelled

# The use of Capillary Ion Chromatography for the Forensic Analysis of Inorganic Ions

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**Abstract:** In recent years, significant progress has been made in the development of capillary ion chromatography (IC) systems with on-line electrolytic eluent generation. The operation of IC separations in capillary format offers a number of advantages. Since the eluent consumption is low, capillary IC systems can be operated continuously and therefore are always on and always ready for analysis. Capillary IC systems provide improved performance in the determination of target analytes at trace levels and also offer improved compatibility with applications where the amount of sample is limited, which is often the case in forensic analysis. The operation of capillary IC systems at low flow rates improves compatibility with mass spectrometry and provides the lowest detection limits in terms of mass sensitivity. In this presentation, we will discuss a new approach of delivering electrolytically-generated high-purity acid and base eluents over an expanded operating pressure range. We will demonstrate examples of performing both fast and high resolution capillary separations of target anions and cations and show the use of capillary IC for the analysis of ions from witness plates and gunshot residue samples.

# Relevance of Uniqueness during Physical Evidence Analysis in Forensic Science

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**Abstract:** Recently, uniqueness has been questioned as an unprovable proposition and individualization has been criticized as irrelevant to forensic science as well as courts. The critics demand that any identification be interpreted on a probabilistic basis as done for DNA profiles. Physical matching, a realistic fact supporting uniqueness is seen omitted in the discussion on individualization. This paper describes case examples illustrating physical matching and other matches such as in capillarity related paint patterns, skull suture patterns and human dentition and indicate that individualizations based on pattern correspondence that exist in the state of nature are relevant as they establish facts on a conclusive basis. Such facts provide firm further leads benefitting criminal investigations and hence cannot be ignored. Following the decades old tenets in the practice of forensic science, uniqueness is proposed as a paradigm relevant for individualizations. Although uniqueness is humanly unprovable, indeterminism, both in the causal pathways as well as in the characteristics, is cited as lending support to uniqueness as a proposition. The demands on proof 'to the exclusion of all others in the world' is shown as argumentative. Characteristics involved in pattern matching are shown as ensemble of visible units dispersed along the entire contour stretching the probability of re-occurrence of a verisimilitude pattern into infinity offering epistemic support to the proposition of uniqueness. Observational science involved in physical matching is seen to generate obviously realistic results and hence cannot be ignored as unreliable. Propositions to follow DNA model for the other patterned evidence existing in the state of nature is shown unacceptable since the patterns in DNA profiles are generated by characteristics that are deterministic. It is suggested that in the absence of evidence contradicting indeterminism, the proposition of uniqueness as the basis for individualization deserves to continue in view of its practical significance in forensic science that is proven.

**Keywords**: physical evidence, uniqueness in physical matching, paint, skull suture and dental patterns, indeterminism in causal pathways, identification and individualization

# From "Secret Mans Business" to "Science" through the Establishment and Development of the National Fire Protection Association's Guide for Fire and Explosion Investigations – NFPA 921

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**Abstract:** The PowerPoint presentation will cover the history of the development and establishment of National Fire Protection Association's (NFPA) 921 Guide for Fire and Explosion Investigations.

The presentation will discuss the evaluation of methods and indicators historically used by Fire Investigators which have been found to be scientifically wrong. Myths such as those surrounding: the Width of a V-Pattern as a direct indicator of a rapidly developing fire and therefore an ignitable liquid has been used; Floor Pattern Analysis as a primary method to substantiate that the fire was Arson; Crazed Glass as an indicator of the rapid buildup of heat and therefore indicating that an ignitable liquid has been used; Concrete/Cement Spalling as an indicator of the use of an ignitable liquid; Low Burn Patterns as an indicator of the use of an ignitable liquid; Burn Intensity as an indicator of the use of an ignitable liquid; and Annealed Furniture Springs in a collapsed state being a reliable indicator of the use of an ignitable liquid.

The presentation will discuss how NFPA 921 has sought to identify scientifically defensible methods and indicators, whilst providing an educational resource to investigators in modern fire science, in a manner that can be understood by the fire investigation community. The presentation will outline the NFPA 921 methodology and its application of the scientific method in fire investigation and discuss the content of chapter 4 in the latest edition of NFPA 921 (2011) where the systematic approach and how the scientific method is adopted and recommended in fire investigation.

# Forensic Examination of Exploded Balloons: A Case Study

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**Abstract:** A group of 8 boys saw a large cluster of colourful balloons descending towards their homes. They collected the balloons and tried to divide them amongst themselves. One of them used a lighter to cut the string. It was reported that this ignited the gas within and the balloons exploded injuring five of the boys aged between 9 to 15, with two suffering serious facial burns while the other three had burns on the body and hands. The Police have subsequently identified the supplier of the cluster of balloons, a man who had been selling balloons at night markets. Several materials were seized including deflated and burst balloons, empty "Coca-Cola" cans, white flaky substance and a modified gas cylinder fitted with a gas regulator. On examination the white flaky substance collected was identified to be sodium hydroxide which when dissolved in water can react with the aluminum 'Coca Cola' cans generating hydrogen gas inside the cylinder and was used to inflate the balloons via a gas regulator attached to the gas cylinder. Hydrogen gas is highly flammable and is a fire and explosion hazard.

**Keywords:** forensic, balloons, exploded, hydrogen gas, explosion hazard

# Why Do They Torture? Ethical Arguments around This Dark Practice
## Prof. Dr. Sherein Salah Ghaleb

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**Abstract:** In the torture debate, some say that it is always immoral to torture. Others insist that if torturing an evil man can save many innocent lives, it is the only moral option. The disagreement turns partly on whether you subscribe to virtue ethics, utilitarianism, or some mix. Comparing the virtues and flaws of those systems is a centuries old enterprise, unlikely to be resolved in our lifetimes. Utilitarians may wind up supporting torture. They said that torture is proved to be an interrogation tactic that saves the most lives and thwarts the most terrorism without awful adverse consequences; it makes sense for a utilitarian to favor the practice. This article might try to persuade them that their ethical system is incomplete and therefore wrongheaded. There are some who insist that torture is always an evil practice, and others who maintain that torture is sometimes the most moral alternative available to us. The disagreement among these folks turns on whether immoral acts are always acts of commission, or whether an act of omission can be immoral. This strikes me as an awfully hard question to answer, about whether torture is ever justified.

**Key words**: ethics, torture, arguments

# Help Seeking Behaviour of Intimate Partner Violence According To Socio-Demorgraphic Aspects in Central Province Sri Lanka, Dr Amal Vadysinghe

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**Abstract:** Prevalence of intimate partner violence (IPV) is high in Sri Lanka. But women's dependence on marriage, lack of educational, occupational and financial resources limit their ability to end violent relationships. Data was collected from 129 cases and analyzed focusing on the socio-demographic factors and help seeking behavior. All cases were of the female sex. Majority were married couples (90%). Thirty three percent were between the ages of 31-40 years. Twenty six percent were educated up to advanced level. Most of the victims (64%) were financially dependent on the other partner. Sixty six percent did not report a family history of spouse abuse while in 25% of accused partners and 8% of victims, a family history of spouse abuse existed. Seventy nine percent of victims had experienced previous assaults. Out of them, 69% had complained to the police but only 29% had undergone previous interventions. The victim's confidence in legal authorities' decreased with increasing number of lodged police complaints. Forty three percent stated the reason for admission to hospital was for security. Sixty percent stated they would accept the other partner while only 8% mentioned to wanting legal separation or divorce. The results indicate that the female sex is the vulnerable group in this context. Majority are married couples which may be due to the fact that living together is not culturally accepted in Sri Lanka as in western countries. Though previous studies have shown that the commonest age group involved is between 20-29 ages, this study reveals that it is between 31-40 years in a Sri Lankan context. Research in other countries pointing out that women's financial dependence limit their ability to end violent relationships was further highlighted in our study. In western countries with mandatory arrest policies in spouse abuse, the arrest rates and victim satisfaction with the system is high. But in Sri Lanka, the number of previous interventions was low though the frequency of police complains was high. The confidence in police decreased with higher number of complaints. In conclusion, majority of victims were between 31-40 years, unemployed, financially dependent on their spouses. Only a minority had undergone previous interventions. Many accept their partner.

# Hydrogen Sulfide Poisoning from Rotten Fish at Tanjung Karang Fishing Village: A Case Study

**Mohd Sukri Hassan**

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**Abstract:** Five fishermen at Tanjung Karang Fishing Village were found dead when they were collecting rotten fish from a cold storage. The storage had been used to store fish while waiting transportation to another place for fertilizer production. Hydrogen sulfide was produced from the rotten fish when the storage was not properly functioned. The gas was inhaled by the victims and it was metabolited in the body as thiosulfate. Gas chromatography-mass spectrometry (GCMS) technique was used to determine and quantitate the amount of thiosulfate in the deceased's bloods. The concentration of thiosulfate is found between 4.5 -24.7 microgram per milliliter.

# Factors Influencing Ethanol Elimination in 20 To 30 Year Old European Males, Sriyal Victor Gregory Mendis

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**Abstract:** In the United Kingdom during 2010 250 people died in drink driving incidents, 8,220 people were injured, 1,230 seriously. Road side breathalyzer tests by the police are the front line in the prevention of drinking and driving in the UK. Statistics show that when the number of breathalyzer tests fall fatalities rise. In certain cases the police use "back-calculation" as a means of estimating blood alcohol concentrations at the time of a prior event. Presently this is done using by using sex, age, height and weight to calculate total body water (TBW) and the average 1st order decay of breath alcohol in man. This study examined the factors that influence the 1st order decay of breath alcohol in man with the objective of improving the accuracy and precision of alcohol "back-calculation".

To reflect the demographics of subjects caught drink-driving 33 males aged 20 to 30 years old were recruited. Each was given 125mL of 40% vodka, diluted in cola, to consume within 5 minutes. Breathalyzer readings were then taken every 10 minutes for four hours to establish the subjects' alcohol elimination rates. Breath alcohol concentration (µg/L) was measured by a Lion Alcolmeter SD-400. Body fat, muscle and water content were measured by bioelectrical impedance. Multiple regression analysis was used to determine the demographic and body composition factors that influence the alcohol elimination rate in these subjects. A statistically significant relationship was also found between alcohol elimination rate and the following factors:-Elimination (µg/L/min) = - 47.7 + 0.558* Waist (cm) + 1.70 *Fat% - 61.0* Muscle% + 1.75* Water% - 0.923* BMI, $r2 = 0.73$. The results of this study will allow the adjustment of alcohol elimination rates by individually tailoring the rate to a subject's body composition. This will allow a more accurate estimate of back calculated alcohol concentration and narrow the confidence interval placed on predicted values by the police and forensic scientists. This will aid the courts in determining guilt and innocence in cases of drunk driving and alcohol facilitated crime.

# An Overview of the Efficacy of Techniques Deployed In Disaster Victim Identification In Regard To the International Guidelines

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**Abstract:** This library based study has been done as a review of the efficacy of techniques deployed in Disaster Victim Identification in regards to the international and UK guidelines. The objective of this dissertation is to elucidate different methods used in human identification during crisis scenarios and to review the factors that contribute to the efficacy of identification process. It is also the intention of this study to examine the usage of standard operation procedures according to international and national agencies. The management and guidelines set in dealing with the identification of mass disaster victims have been extensively discussed as it commensurate the importance of ensuring the standard operation procedures that need to be followed during catastrophe. Identification process began with recovery, laboratory analysis and analytical findings and which results in positive identification, which includes single death case to mass fatality scene. There are many techniques and equipment or tools that have been developed over the years to accommodate and facilitate in human identification process. Even though there are many techniques and equipment that exists, not all gives accurate and precise results in human identification. Efficacy of the techniques and equipment should be analysed accordingly. The efficacies of techniques discussed mainly are on Anthropology, Odontology and Forensic DNA. Even though, DNA based identification is known as 'gold standard' in human identification, it does not necessarily reflect the reality as there are several situations when DNA techniques do not produce positive identification. Based on past studies, WTC terrorist attack and the Asian Tsunami have proven that not all the bodies have been identified by DNA technique alone. Forensic science has always been a multivariate field and various techniques have been adapted to achieve the notion of human identification. It was clearly experienced by the global forensic community that by marrying a few methods will produce reliable evidence and anticipate further for positive identification as a result.

**Keywords:** Disaster Victim Identification

# Abstracts for Poster Presentation

## The 2nd International Forensic Science Symposium
## 14th to 16th November 2011
## Hotel Le Meridien, Kuala Lumpur, Malaysia

## Analysis of AmpFlSTR SGM Plus™ and PowerPlex 16TM PCR products interchanging the size standards GeneScan-500ROX and ILS-600

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**Abstract:** Short tandem repeat (STR) based DNA typing employing multiplex polymarase chain reaction (PCR) technique is familiar worldwide in forensic investigations and population genetic studies. SGM Plus™ and PowerPlex™ systems, are two popular multiplexes that can amplify concurrently 10 and 15 autosomal STR loci respectively with sex determinant amelogenin marker. In this study we evaluated a total of 21 DNA samples whether PCR products from SGM Plus™ primer set (Applied Biosystems) could be sized precisely with internal size standard from Promega's PowerPlex™ 16 (ILS-600) and the same were evaluated from amlicons from Promega's PowerPlex™ 16 with GeneScan-500ROX, the internal size standard of Applied Biosystems. In all cases full concordance were found when comparing profiles from amlicons sizing with their respective and substituted internal size standard. Situation might arise in which Internal size standard might be run out leaving the other components of the kit in spare due to disproportionate use or accidental cause. In that situation if internal size standard of a different kit were useable it would provide a way to handle the emergency condition as well as to save the costly consumable. This study has demonstrated its significance to bring the information to scientific community that PCR products form SGM Plus™ and PowerPlex™ 16 could be sized with an absolute accuracy even if their respective internal size standards are subject to interchange.

## Application of Infrared Spectrum and Multivariate Analysis In Classification And Discrimination Of Black Ballpoint Pen Inks

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**Abstract:** Identification of pen inks on questioned documents is an important step in forensic document examination field. In this study, fundamental principles for micro-ATR-FTIR coupled with multivariate analysis techniques were developed. The main objective of this study is to evaluate feasibility of application of micro-ATR-FTIR and multivarians analysis in classification and discrimination of black pen inks from different models and brands. A total of 155 sample pens composed of 40 models and nine (9) brands being sampled from supermarket at Subang Jaya. Characteristics of black pen inks have been analysed with microATR-FTIR. The obtained spectral showed differences between pens of different models/brands. Subsequently, the obtained spectrum data have been analysed with multivariate analysis techniques: cluster analysis (CA), followed by principal component analysis (PCA) and finally discriminant analysis (DA) using *Statistical Package for the Social Sciences* (SPSS) software. Classification accuracy above 70% has been achieved through multiavariate pairwise group analyses. Flow charts for identification of pen inks have been developed based on presence or absence of significant differences between sample spectrum and reference spectrum on particular variable. In general, spectral of pen inks could be discriminated better at brand-level than model-level. Meanwhile, discrimination between spectral of pen inks of same model and brand but of different pen point saiz could not be achieved. Although full discrimination between pen based on brands and/or models was not achieved, the obtained results showed that combination of microATR-FTIR and multivariate analysis was able to act as a fast and easy discrimination tool in differentiated pen inks according to the selected brands and models.

# Forensic Classification of Glass Employing Refractive Index Measurement

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**Abstract:** Burglary and accident cases may involve glass fragments as physical evidence found at the crime scene. In forensic investigation, the major physical examination to determine the origin of glass is refractive index (RI) measurement. It was therefore of interest to determine RI measurements of several types of glasses commonly found in Malaysia with a view of classification according to the major glass types of building and automobile glasses. In this study, the RI value was differentiated from various manufacturers, thicknesses, colors and type of glass. Twenty samples of glass from each type were collected from car workshops and glass shops. Determination of RI value was affected using Glass Refractive Index Measurement 3 (GRIM3) instrument. Four manufacturers of automobile glass chosen were Malaysian Sheet Glass (MSG), MCIS Safety Glass, Diamond PMK and China. Meanwhile, the building glass samples were taken from MSG, Kien Safety Glass, Hesin Glass and China manufacturers. The RI value for automobile glass was found to be in the range of 1.51680-1.52960 while building glass is was in the range of 1.51465-1.52250. Results of this study also indicated that, thicker glass possessed higher RI value while colored glass showed higher RI value compared to that of a transparent glass of a similar type. Therefore, each manufacturer has different range of RI value that belongs to each classification due to its thickness, color and types of glass. Thus, the origin of glass according to its manufacturer could be determined by RI measurement to assist in forensic scientists in their investigation.

**Keywords:** Refractive Index (RI), glass, forensic investigation, GRIM3

# Application of Loss Causation Model in Forensic Investigation

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**Abstract :** Industrial accidents/incidents are usually the outcome of multiple root cause/casual factors, recognition of their interrelationship can assist in understanding how and why accident occurs. One of the methods that can be used to identifying the multiple causes of the accident is Loss Causation Model which can be presented as a chart consisting of 5 blocks that represent the sequence of cause components of loss, incident, immediate cause, basic cause and lack of control. In this study, Loss Causation Model was applied to identify the root causes of the collapse of a luffing crane at a construction site in the state of Selangor which has been investigated by the forensic engineering team of Department of Occupational Safety and Health (DOSH), Malaysia. A fundamental starting point of the case study is to develop a clear understanding of the causes leading to incidents and what controls need to be implemented to prevent recurrence. Forensic investigation revealed that the fundamental causes of incidents were failure of the system of work, rather than substandard acts, behaviors and conditions. The behaviors, acts and conditions were found to be merely signs of underlying problems. Focusing on systems and work processes yields long term improvements in incident preventions, whether incidents result in harm to people, property, process or the environment.

# Competencies that are expected from a medical officer in performing medicolegal duties: A Delphi study conducted in Sri Lanka

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**Abstract:** The Sri Lankan medicolegal system expects medical officers, whether specialist or non specialist, to perform medicolegal duties. It is believed that identification of competencies required to perform medicolegal duties would help in the development of both undergraduate and postgraduate curricular. The Delphi technique was employed to identify competencies that are expected from a medical officer to perform medicolegal duties. Two rounds of questionnaires were administered to Judicial medical officers where they were requested to rate the competencies listed according to a scale. G*roup consensus agreement* was established if the total agreement was >=90% in the essential category after the first Delphi round and >=90% in the essential category after the second Delphi round with a net change of less than +/-10% between the two rounds. Competencies which received group consensus agreement as essential were to (1) Physically examine patients, for medicolegal purposes, in a thorough and sensitive manner, (2) Conduct an autopsy using routine dissection procedures, (3) Observe autopsy phenomena accurately, (4) Differentiate postmortem changes from antemortem phenomena, (5) Determine the cause of death, (6) Identify abnormalities in the body that occur due to trauma, (7) Describe injuries for medicolegal purposes, (8) Interpret injuries and injury patterns for medicolegal purposes, (9) Identify the living and the dead for medicolegal purposes, (10) Investigate asphyxial deaths for medicolegal purposes, (11) Investigate a case of poisoning for medicolegal purposes, (12) Investigate a case of drunkenness/substance abuse, (13) Utilize facilities/services related to medicolegal practice appropriately, (14) Maintain chain of custody in communicating with relevant institutions, (15) Maintain confidentiality in communicating with relevant institutions, (16) Communicate effectively with court, (17) Handle patients and their relatives in an ethical manner, (18) Recognise the rights of people, (19) Identify signs that suggest abuse/neglect, (20) Investigate a suspected case of abuse/neglect, (21) Know what action to take to  safeguard the welfare of the abused/ neglected, (22) Investigate a victim alleging sexual abuse for  medicolegal purposes, (23) Record data and observations accurately, legibly in the relevant documents, (24) Ensure safety of documents and (25) Develop professional values like responsibility, honesty and commitment to scientific methods.

# DNA Profiling of Jawa-Malay Subethnic Group as Inferred from HS2.25, HS3.23 and HS4.69 Alu Insertion Polymorphism

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**Abstract:** The identical by descent *Alu* insertions polymorphisms are approximately 300bp in length that mobilizes via the process of retrotransposition. Once inserted in certain loci, the new *Alu* element cannot undergo deletion or rearrangement. DNA samples were collected from buccal cells of 45 unrelated Jawa-Malay individuals using the FTA cards. An attempt was made by amplifying HS2.25, HS3.23 and HS4.69 *Alu* loci from the genomic DNA.  The amplified products were separated on 2% agarose gel and visualized under UV light. HS2.23 *Alu* loci were polymorphic while *Alu* insertions HS2.25 and HS4.69 were fixed for the presence of *Alu* insertion polymorphisms. The mean of *Alu* insertion frequencies is 0.9580. The average heterozygosities across loci are 0.0805 and the value of $F_{ST}$ is 0.0063. F-statistics across loci show that Jawa-Malay sub-ethnic group indicates little genetic differentiation and suggested that inbreeding among family members might occur within these populations. This study provides a valuable preliminary data to further study of Jawa-Malay sub-ethnic group of Malaysia.

# Regression Analysis for Stature Estimation In Malaysian Population Using Hand Anthropometry

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**Abstract:** Personal identification of isolated extremities or severed human remains that are frequently found in cases of mass disaster, fatal assaults and criminal mutilation is very important step in medico-legal autopsies. In forensic investigations, stature estimation from extremities and their parts are widely used to identify the deceased identity. This study attempts to predict the stature of a person by using hand length and hand breadth. Stature measurement, hand length and hand breadth consisting of 270 Malay individuals (150 males and 120 females), 120 Chinese individuals (60 males and 60 females), 50 Indian individuals (20 males and 30 females) and 60 Bumiputera Sabah Sarawak individuals (30 males and 30 females) ranging in age from 20 to 79 years were taken independently on left and right side of each individual. Linear and multiple regression models were derived by using SPSS version 19 to estimate the stature from hand dimensions. Linear and multiple equations were found to be positive and statistically significant; however multiple regression equations were more helpful in estimating the stature. Estimated stature and actual stature were compared to check the accuracy of the regression equation.

**Keywords:** stature estimation, hand dimension, forensic anthropology, Malaysian population

# Comparison of Mitragynine Content in Young and Mature Leaves of Mitragyna Speciosa Using Gas Chromatography-Mass Spectrometry

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**Abstract:** Until recently, the Thai medicinal plant Mitragyna speciosa (Ketum in Malaysia) is misused as herbal drug of abuse. Ketum is legal in most of the world except for Cambodia, Australia, Malaysia, Thailand, and Myanmar. For this reason it is typically sold as incense online and can still be bought at markets in more rural towns especially in Malaysia and Thailand. The leaves have been used by natives for their opium-like effect and cocaine-like stimulant ability in order to combat fatigue and to enhance tolerance to hard work. The active ingredient, Mitragynine itself is documented to be a depressant. The present study was undertaken to determine and compare the mitragynine content from mature and young ketum leaves. In this study, ketum leaves were collected from a rural town in Kedah. Methanolic extracts of the dried leaves were analyzed using gas chromatography-mass spectrometry (GC-MS). Comparison of the total ion chromatogram (TIC) profiles of the young and mature ketum leaves revealed that the methanolic extracts of young leaves possessed higher alkaloidal content of mitragynine as compared to the mature leaves. It was also noted that the mature leaves of ketum plant can be easily distinguished from the young leaves via the presence of an intense analyte peak in the TIC profile that corresponded to a squalene-type compound.

**Keywords**: Mitragyna Speciosa, mitragynine, GC-MS, TIC profile

# Recovery and Analysis of Gasoline from Burned Animal Tissue

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**Abstract:** Petroleum-based accelerant such as gasoline is very common in cases related to fire and arson cases. Recovery and analysis of gasoline from the various burned conditions of animal tissue were carried out in this study emphasised on the detection accelerant after combustion. This research was done as a simulation of the real fire and arson cases that occur to cover up the committed crime and also to destroy the physical evidences presence at the crime scene. The animal tissue was prepared from the rats captured at selected places surrounding Insitut Ibnu Sina, Universiti Teknologi Malaysia (UTM), Skudai Johor. The animal tissue was burned by using gasoline (Petronas, Ron 95) as the liquid fuel, and woods and cotton clothes as the solid fuels. Extraction via adsorption and elution methods under low pressure by using activated charcoal were carried out to recovered the combustion products (volatile and partially volatile substances) of burned animal tissue. Samples from the extraction processes were analytically analysed using Gas Chromatography/Mass Spectrometry instruments for the detection. The profile of gasoline was successfully detected and obtained from the various burning condition of animal tissue.

**Keywords**: gasoline, animal tissue, GC/MS

# Haematological Response to Carbon Monoxide Intoxication via Automobile Exhaust Gas Inhalation

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**Abstract:** Inhalation of automobile exhaust gas causes several adverse health effects, especially respiratory and hematologic disorders, and often leads to death by carbon monoxide (CO) intoxication. Exposure to the automobile exhaust gas has been reported as a common suicide method among Malaysian. In this study, two groups of rabbits were exposed to different concentrations of CO from automobile exhaust at 1013 mbar ambient pressure. Level of haemoglobin was measured using Avoximeter 4000 and full blood count was conducted to investigate the effect of CO on the blood component. The amount of carboxyhaemoglobin (COHb) was generally found to increase with an increase of CO concentration. However, the increase of CO concentration was found to lead to a decrease of platelet and hematocrit count, resulting in alteration of blood agglutination. CO was found to not only react with haemoglobin and lowered the concentration of oxyhemoglobin ($O_2Hb$), but it also affected other blood components and caused haemorrhage of both right and left lung of the animal under experiment.

**Keywords:** automobile exhaust, inhalation, rabbit, carbon monoxide intoxication, platelet, hematocrit, carboxyhaemoglobin, full blood count

# Forensic Application of Palynology, Mineralogy and Plant DNA Profiling of Hevea Brasiliensis Plantation Area

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**Abstract:** Palynology, mineralogy and plant DNA profiling are fields of study which could be implemented for forensic cases such as murder, rape, theft, drugs and so on. Development in these fields may help relevant authorities to carry out detailed and efficient forensic investigations. This study was aimed at developing appropriate and precise methods based on soil and leaves samples. Samples of soil and leaves were taken from a simulated crime scene. The morphology of pollen plants species such as *Andiantum trapeziforme L., Adiantum latifolium Lam* and *Cyathea latebrosa* were determined by scanning electron microscope - energy dispersive x-ray(SEM-EDX). Five plant species namely *Clidemia hirta, Davallia denticulate, Eragrostis amabilis, Elaeis guineensis* and *Commelina diffusa* were analyzed with PCR and gel electrophoresis. A genetic analyzer was used to determine DNA profiling of plants. Fragment analysis was performed using Mega and Sequence Scanner. Control soil samples from rubber tree plantation areas were analyzed for parameters such as pH, conductivity, organic carbon, total nitrogen, available phosphorus, exchangeable basic cations(Ca, Mg, K, Na), cation exchange capacity, clay, silt, fine sand and coarse sand to determine unique characteristics of a soil. Ten soil series were analyzed for their chemical and physical properties. Atomic absorption spectrophotometry was used to determine exchangeable bases for soil analysis. Results of this study indicated the need for a database for plants and soil in Malaysia in order to facilitate forensic investigations.

**Keywords**: palynology, mineralogy, plant DNA profiling, forensic investigation

# Assessment of Genetic Relationship of Malay Sub-Ethnic Groups using HLA Class I and Class II Allele Frequencies

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**Abstract:** One hundred and sixty one Malay blood samples were collected from 5 Malay sub-ethnic groups namely Kelantan (n=59), Acheh (n=11), Kedah (n=26), Champa (n=43) and Pattani (n=22) with an objective to study their genetic relationships. The samples were analyzed for low resolution HLA typing using sequence specific primer (SSP). The data generated was statistically analyzed by using Multivariate Statistical Package 3 (MVSP3). Principal Coordinate (PCO) Graph was constructed by using the software. The distance matrix of the studied Malay Sub-ethnic groups and other populations in literature were calculated and then plotted on a PCO graph. The PCO graph was constructed based on HLA-A, -B and –DRB1 allele frequencies. Based on the PCO graph, the genetic variability in axis 1 is 29.48% and in axis 2 is 17.54%. The total amount of genetic information that were used to infer genetic relationship between the Malay sub-ethnic groups with other published populations is 47% for HLA-A, -B and –DRB1 loci. Principle coordinate analysis graph shows that the studied Malay sub-ethnic groups share a close genetic relationship with each other and with other Malay sub-ethnic groups obtained from literature (Hisham *et al*.,2009) and with indigenous populations of Malaysia namely Iban, Temuan, Bidayuh, Kadazan and Jehai (Jinam *et al*.,2009; Dhaliwal *et al*., 2009).

# Comparison of the Incubation Protocols in Chelex DNA Extraction Method for Forensic Samples

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**Abstract:** DNA extraction for forensic samples in the laboratory is carried out using Chelex extraction method where it requires incubation temperature at $38^0$C and then $56^0$C in the thermomixer based on the test method applied in the whole department. However, due to minimal number of thermomixer unit against the large number of sample extracted at one particular time, this study was conducted to compare the modifications of the incubation protocols by substituting the temperature/ thermomixer with the thermostat block, oven and room temperature condition. The substitution of the usage of thermomixer with thermostat block, oven and room temperature condition for the incubation protocols in the chelex DNA extraction method in order to obtain same DNA yield and good DNA profile in this study was successfully carried out. Consistent DNA profiles were obtained despite using three different incubation protocols in extracting the DNA, thus indicating that the modifications in the extraction method protocols can be done if and when necessary in the laboratory.

**Keywords**: Chelex DNA extraction, incubation protocols, DNA profile

# Trend of Drug Abuse in Singapore

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**Abstract:** In this paper, the trend of drug abuse in Singapore over a six-year period from 2005 to 2010 was examined and reviewed. In this period, the most commonly abused drugs were benzodiazepines, heroin, ketamine, and ice. Abuse of a particular traditional drug, heroin had increased sharply over the years, whereas the abuse of benzodiazepines had decreased rapidly. In 2005, heroin exhibits accounted for 3.4% of all exhibits analysed by Illicit Drugs Laboratory. By 2010, this figure had risen about seven-fold to 20.2%. Heroin exhibits received were usually South-East Asia Heroin No.3 which typically had a purity of less than 10%. The proportion of other traditional drugs such as opium and cannabis stayed between 2-4% throughout the years. The number of ice exhibits had tripled from 3.6% in 2005 to 10.5% in 2010. And for the amphetamines-type stimulant (ATS) tablets, the number of exhibits received had remained fairly constant, averaging about 5% of the total number of exhibits received for the past six years. A similar trend was observed for ketamine exhibits which averages about 7% of the total number of exhibits per year. Benzodiazepines, in contrast, had decreased tremendously through the past six years. The number of benzodiazepine exhibits received declined sharply from 1765 in 2005 to 822 in 2010, showing a reduction of more than 50%. In particular, the number of midazolam exhibits had decreased from 27.0% to 3.1%. Another interesting trend observed was the decreasing number of buprenorphine exhibits which is a medication used for the treatment of opiates addiction. In 2005, buprenorphine exhibits accounted for 12.7% of all the exhibits received but in 2010, it only accounted for a mere 0.7%. With the emerging trend of legal highs being abused worldwide, the laboratory received between January and September 2011 twenty three cases of ATS tablets which were analysed and found to contain ketamine and a variety of legal highs. These legal highs include fluoromethcathinone, 3,4-methylenedioxymethcathinone (methylone or βk-MDMA), and 1-pentyl-3-(1-naphthoyl) indole (JWH-018). There were also two exhibits of vegetable matter which were found to contain 1-pentyl-3-(1-naphthoyl) indole (JWH-018) alone or together 1-butyl-3-(1-naphthoyl)indole (JWH-073). The drug abuse pattern and trend for each drug type will be presented and discussed in this paper.

**Keywords**: drugs, abuse, trend

# Identification of Sildenafil Citrate and Its Analogues in Matrix of Coffee Powder Assisted by Using LC-MSMS

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**Abstract:** Sildenafil Citrate (SC) an active ingredient in Viagra and has become one of the most commonly prescribed pharmaceuticals drugs to cure sexual deficiency. Sildenafil was a drug that is taken by mouth in the treatment of impotence. It enhances the erectile respone to sexual stimulation and is used for the treatment of men who have difficulty in obtaining or maintaining an erection. In Malaysia, media has widely reported about the abuse of sildenafil. In the last few years, there are many products which being introduced into the market has been added with sildenafil citrate in order to help men to encounter their problem of having sex either they having erectile dysfunction or not. However, in order to avoid from being caught, these ED drug had gone through structurally modified known as sildenafil analogues. According to Jabatan Kimia Malaysia Johor, there are still many sildenafil analogues that not been detected yet. Therefore, in this study, we would like to develop a method to determine sildenafil analogues in order to minimize the abusing of this particular drug. This method will cover the qualitative analysis and specific criteria for the identification of sildenafil and its analogues assisted by LC-MSMS. For this study, 24 analogues included sildenafil will be analyzed for single standard and also for mix standard. The results are reported in µg/ml corrected to 3 decimal places. The threat posed by the covert use of analogues is obviously under recognized in our society. For which reason, it is critical to introduce an effective surveillance system and control measures to tackle the problem.

**Keywords**: Sildenafil, Sildenafil analogues, LC-MSMS

# Comparison of On-Line Signatures and Off-Line Signatures Using Digital Pen and PDA

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**Abstract:** Signature is a unique identification that exhibits distinctive individual characteristic. With the evolution of current technology, the digital signatures have been commercially applied in daily transaction along with the normal, traditional handwritten signatures. However, the different lies in the nature of both types of signatures. Therefore, there is a need for Document Examiners to attend to the revolutionary approaches in dealing with such challenges. In this study, it is proposed that a digital signature produced by a PDA is an on-line signature and a normal handwritten signature produced by a digital pen is an off-line signature. Based on nine selected features, comparison was carried out between specimen signatures of 45 respondents obtained using these devices. A statistical test of Correspondence Analysis (MANOVA) also has been carried out. The variations observed between specimen signatures of both devices as well as the result of MANOVA confirmed that there are significant differences in the features between specimen signatures obtained using digital pen and PDA. The signatures of the PDA are less reliable and less reproducible in comparison with signatures of the digital pen. Hence, digital signatures produced by PDAs are not suitable to be used in comparison with normal handwritten signatures.

**Keywords:** signature, on-line signature, off-line signature, digital pen, PDA

# Optimization of Headspace Solid Phase Microextraction-Gas Chromatography-Flame Ionization Detection for Diphenylamine and Its Nitrated Derivatives in Smokeless Gunpowder

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**Abstract:** Smokeless powders are commonly used propellants in ammunition. Other than nitric esters as the major components, stabilizer is added to prevent the buildup of nitrous and nitric oxide from these esters, and thus increasing the shelf life of ammunition. Headspace solid phase microextraction-gas chromatography-flame ionization detection (SPME-GC-FID) was reported for determination of diphenylamine and the nitroso- and nitro-derivatives of diphenylamine. In this study, SPME procedure was performed by implementing 100 μm polydimethylsiloxane fiber on 9 mm SME ammunition type and analyzed by GC-FID. The study employed the utilization of multivariate experimental designs for the optimization of extraction-influencing parameters. Two-level full factorial design first order design determined the influential variables which were the extraction time and sample temperature. These influencing parameters were further optimized through the application of Doehlert matrix design and response surface methodology. Extraction time of 25 min and sample temperature at 74 $^{\circ}$C was selected as a compromise conditions to ensure efficient extraction by SPME. This simultaneous optimization of several variables studied by SPME-GC-FID was confirmed, involving fewer experiments, at lower cost and reduced time for the development of efficient SPME procedure.

**Keywords:** forensic science, smokeless powder, diphenylamine, solid phase microextraction, gas chromatograohy-flame ionization detector

# Case Study – Explosion Investigation

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**Abstract:** The PowerPoint presentation will cover a case study of gas explosion investigation at a factory construction site. The presentation will discuss the general process in conducting an explosion investigation based on an actual case investigated by the presenter, with application towards the insurance industry. The focus of the presentation will be on examination and interpretation of physical evidence to determine whether an explosion had actually occurred; identification of type of explosives that may be involved; identification of the cause of explosion; and discussion on recommendations for risk mitigation in similar industrial settings. The presentation will serve as an introduction on the application of theories taught in modern explosion investigation, in a manner that can be understood by students, practitioners of forensic science, and the community in general.

# Case Study: Deliberate Fire at Warehouse Area for Perishable Goods

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**Abstract:** The PowerPoint presentation will cover a case study on an investigation of a structure fire of deliberate nature at a Warehouse Area for Perishable Goods. The presentation describes the scientific method approach to determine the cause and nature of the fire. The discussion and findings were based on the evaluation and analysis of the identified physical evidence, relevant background information and circumstances surrounding the fire, as well as the inconsistencies that indicate a suspicious fire. The presentation will also cover the challenges and limitations of the investigation.

**Technical Committee Members**

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