

THE ADVANCEMENT OF FORENSIC DNA TECHNIQUE IN MALAYSIA

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Abstract: DNA profiling methods have been used extensively in the testing of human identity. The technology has seen a steady and assured progress for the past 23 years until DNA evidence is now being recognised as indisputable proof in crime scene investigation as well as in paternity testing. Malaysia has made plans to implement DNA analysis since 1990 by sending officers to laboratories in Japan and Singapore to acquire knowledge and skills. In 1994, the Department of Chemistry Malaysia makes a debut in DNA profiling in its forensic casework at its headquarter laboratory in Petaling Jaya, Selangor, Malaysia. Restriction Fragmented Length Polymorphism (RFLP) technique with single locus radioactive detection was used in forensic DNA analysis, however, the technique involved the usage of radioactive components which could be harmful.

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PROGRAMME BOOK

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VALIDATION STUDY OF QUANTIFILER TRIO DNA QUANTIFICATION KIT USING APPLIED BIOSYSTEMS QUANTSTUDIO 5 REAL-TIME PCR SYSTEM

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Abstract: DNA quantification of human biological samples is significant in STR profiling in order to produce the interpretable profile successfully. Additional information apart from total human DNA is essential in determining further action for downstream processes, such as the status of degradation and mixture of male and female DNA samples. Quantifiler Trio DNA Quantification Kit which provides such information was evaluated using Applied Biosystems QuantStudio 5 Real-Time PCR System and HID Real-Time PCR Analysis Software v1.3 for casework implementation. Incorporating Quantifiler Trio DNA quantification kit in the workflow of STR profiling will improve the efficiency of forensic DNA laboratory to report DNA casework samples.

Keywords: validation; Quantifiler Trio; QuantStudio 5.

KNOWLEDGE, AWARENESS AND PREVALENCE OF SEXUAL HARASSMENT CASES AMONG MIGRANT WORKERS IN MALAYSIA

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Abstract: Sexual harassment is a common issue faced by workers. Migrant workers often become victims of sexual harassment in the workplace, especially women workers. This study aims to identify the prevalence of sexual harassment among migrant workers in Malaysia based on quantitative questionnaires. Respondents were from Subang Jaya, Shah Alam, Petaling Jaya, Kuala Lumpur and Sabah. Overall, the respondents (n= 361) comprised of 124 Indonesians, 78 Nepalese, 22 Bangladeshis, 8 Brunei, 3 Istanbul, 15 Myanmar, 7 Pakistan, 93 Philippines, 6 Thai and 5 Vietnamese. There is a significant mean difference between action and gender ($P < 0.05$) while there is no significant between knowledge and gender ($P > 0.05$), as well as between suggestion on solution and gender ($p > 0.05$). However, there was a moderate significant correlation between knowledge and action to prevent sexual harassment ($r = 0.55$, $p < 0.01$) but a weak significant correlation between knowledge and suggestion on solution ($r = -0.05$, $p > 0.01$) and also between action to prevent sexual harassment and suggestion on solution ($r = -0.10$, $p > 0.01$). Moreover, the knowledge was shown that statistically significantly to predict prevention, $R^2 = 0.30$, $F(2, 358) = 79.18$, $p < 0.01$ and the suggestion was not statistically significant to predict prevention, $R^2 = 0.30$, $F(2, 358) = 79.18$, $p < 0.01$. The study has shown that knowledge and understanding level as well as the action to prevent sexual harassment was respectively moderate correlation among migrant workers in their life. Therefore, the migrant workers have gained benefits through this survey, including their level of understanding and prevention of sexual harassment issues.

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BODY MASS INDEX (BMI) CHANGES ON UNIVERSITI SAINS MALAYSIA STUDENTS

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Abstract: Weight gain among university students have been identified as a serious threat to health. However, only few studies have focus on this group for prevention efforts. The present study is aimed to measure changes in BMI in reservists among USM students by comparing intervention group (by reservist army training) and non-reservist group (normal participants). The present study explores the effects of exercise on BMI measurement. Significant changes in BMI were detected between reservist and non-reservist group ($p= 0.001$). BMI of participants in reservist group decreased for the post-test measurement while increased in non-reservist group. Apart from BMI, muscle mass ($p= 0.001$) and body weight ($p= 0.001$) also showed a significant difference between intervention and control group. However, body fat percentage (BF%) ($p= 0.476$) and height ($p=1.0$) did not reveal significant different between the two groups. Further studies are needed to explore the factors that could cause weight gain and method that can help student in building a healthy lifestyle.

THE MURDER CASE OF COSMETICS MILLIONAIRE DATUK SOSILAWATI LAWIYA: A CASE STUDY

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Abstract: One of the biggest cosmetics entrepreneur, Datuk Sosilawati together with three of her companions were reported missing by the family members after they left to Banting. A few days later, Bukit Aman Criminal Investigation Department (CID) confirmed that four victims were murdered brutally and burnt at a farm. Four suspects, including a lawyer were detained pertaining to the case. In order to establish a murder case, it is very important to prove the victims were indeed dead and the accused were the ones who committed the murder. However in this particular case, no dead bodies were recovered. The judge sentenced the culprits to death by hanging for each of the charges due to trail of evidence in a form of personal belongings and blood of victims although no bodies were recovered in this case. This case study discusses on the various evidence recovered and limitation regarding the case.

Keywords: case study; Sosilawati; evidence.

MESSAGE FROM THE CHAIRMAN OF THE ORGANISING COMMITTEE

A very warm welcome to all participants to the Forensic Science Seminar (FSS) 2018 hosted by Forensic Science Society of Malaysia (FSSM).

We are delighted to host this event as a spark to gather professionals, researchers and academicians from the country for a mutual exchange of insights, views and experiences on current and future developments in the area of forensic sciences in the age of disruption.

The Forensic Science Seminar 2018 with the theme “Advancing Forensic Sciences” includes presentations from invited speakers, and e-poster presenters to share information about research and development, education and other updates to FSSM members and invited participants.

We are indeed grateful to our strategic partner who has generously sponsored this event. My appreciation also goes to the Directory-General of KIMIA Malaysia for his strong support. I sincerely appreciate the participants from FSSM members as well as participants from Royal Malaysia Police, Fire and Rescue Department, Malaysian Maritime Enforcement Agency, Department of Chemistry Malaysia, Hospitals including HKL and Sarawak General Hospital, as well as universities including USM, UKM, UTM, MSU and UiTM. I am thankful to the organising committee members for their efforts in making this seminar a successful one.

Have a wonderful time at the seminar! Thank you!

DCP (R) Dato' Dr. Yew Chong Hooi
Chairman, Organising Committee FSS 2018

ORGANISING COMMITTEE

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CANNY ONG'S MURDER CASE REVIEW

Muzlifah Sahrir

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Abstract: On 13 June 2003, a young IT analyst Canny Ong disappeared mysteriously at a shopping mall's parking lot in Bangsar after a farewell dinner with her family and friends. CCTV from the parking lot recorded that she was abducted from the Bangsar Shopping Centre in the early hours of that day. Police found Canny Ong's badly burnt remains buried under two cement-filled tyres in a covered manhole four days after the abduction. After a thorough investigation, the police managed to capture the suspect, a 27 year old aircraft cabin cleaner named Ahmad Najib Aris. Eighteen exhibits, ranging from blood and semen-stained material, burnt hair and samples of vaginal fluid were tendered in the High Court during Canny Ong trial. A pair of jeans, which had Canny Ong's bloodstains, was among 11 items seized from the house of accused. Semen collected from the remains of Canny Ong matched the DNA profile of Ahmad Najib Aris. The Chemist stated to the High Court where the case was a death knell to the suspect's defense in a rape-cum-murder trial. The accused confessed to the High Court that he killed Canny Ong to hide the fact that he had raped her, by stabbing her twice in the stomach and leaving her to bleed to death in a manhole. Ahmad Najib was sentenced to death by the Shah Alam High Court on Feb 23, 2005, for murdering Ong. After spending 11 years on death row and having exhausted all his appeals, Ahmad Najib Aris was finally executed (hanged) on 23rd of September 2016.

Keywords: case review; murder.

THE RELATIONSHIP BETWEEN THE MODULATING EFFECTS OF ARMY TRAINING ON USM STUDENTS

Nurul Syahmin Binti Amir Hamzah

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Abstract: Many previous studies have aimed to measure neurocognitive performance of military personnel before and after deployment. However, to our knowledge, there are no study that measure neurocognitive performance of reservist among students before and after reservist training. Hence, in this study, we implemented two neurocognitive tests to measure participants' neurocognitive functions before and after reservist training. Computerised Cambridge Neuropsychological Test Automated Battery (CANTAB) is one of the oldest computer-based tests that are used to evaluate neurocognitive functioning particularly in clinical trials research. Montreal cognitive assessment (MoCA) is a screening tool for cognitive impairment and commonly applied to detect several diseases such dementia, Alzheimer, and stroke. Forty-four intervention (n= 44) and forty-four control students (n= 44) participated in this study. Participants were informed that there were two sessions and that they should attend the second session after one-month gap. Based on the results, there were no significant difference between pre- and post-training session for both groups. No significant difference was observed between intervention and control group. Besides, there was also no significant differences between MoCA test score and CANTAB test measure outcomes.

SEMINAR PROGRAMME

0830-0900	Registration
0900-0910	Opening Speech DCP (R) Dato' Dr Yew Chong Hooi President of Forensic Science Society of Malaysia
0910-0930	Forensic Application Using Handheld Raman Analysis Mr Wong Chee Ping Agilent Technologies Sales (M) Sdn Bhd
0930-1000	Introduction to Chemical, Biological, Radiological, Nuclear and Explosive (CBRNe) Mr Ahmad Shamsul Irwan Bin Mohd Zaki Department of Chemistry Malaysia (KIMIA)
1000-1030	Bioterrorism: Malaysia's Preparedness SAC Dato' Hussein Omar Khan Royal Malaysia Police (PDRM)
1030-1100	Tea-break & Demonstration on Portable Raman Equipment
1100-1120	Forensic Goes Green: Developing Latent Fingermarks Using Natural Waste Ms Revathi A/P Rajan Universiti Sains Malaysia (USM)
1120-1140	In the Line of Fire: Pyrolysis Products Speak Dr Gina Francesca Gabriel Universiti Kebangsaan Malaysia (UKM)
1140-1200	The Challenges on Explosive Detection Dr Mohamad Afiq Bin Mohamed Huri Universiti Teknologi Malaysia (UTM)
1200-1220	Juvenile Crime: The Reasons I Did It Ms Nadiah Syariani Binti Md Shariff Management & Science University (MSU)
1220-1240	Emergence of New Psychoactive Substances in Malaysia Dr Vanitha A/P Kunalan Department of Chemistry Malaysia (KIMIA)
1240-1300	Closing Remarks
1300-1400	Lunch

ABSTRACT FOR ORAL PRESENTATION

FRACTURE PHENOMENA IN SODA LIME SILICA GLASS CAUSED BY BULLET IMPACTS

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Abstract: A series of studies was performed to investigate the fracture patterns caused by different calibres fired from different weapons onto soda lime silica glass of different dimensions. Each bullet of a specific calibre and type produced a unique pattern by which it can be identified. Furthermore, the same calibre bullets (9 mm round nose and flat nose, and 5.56 mm rifle calibre) discharged from two different weapons (pistol and sub machine gun for 9 mm caliber, and rifle and Carbine for 5.56 calibre) produced distinguishable patterns on the basis of the types of weapon. It is found that the dimension of the glass target has an influence on the fracture patterns caused. The waves setup in the glass by the impact of the bullet, responsible for the fracture pattern, are influenced by the boundary conditions obtained at the glass frame. The data and analysis presented can be used in real crime scene reconstructions involving shooting incidents including those in which bullets have passed through intermediate glass targets. It would also help the material scientists to understand better the behaviour of this type of glass subjected to high velocity bullet impacts so that better bullet proof glass constructions could be conceived.

Keywords: soda lime silica glass; bullet impact; fracture pattern; dimension; calibre.

DEVELOPMENTAL TOXICITY STUDIES OF BATIK DYE USING ZEBRAFISH

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Abstract: Batik dye wastewater can cause severe problem if not handle properly. The present study assesses the developmental toxicity effect of Remazol Black B dye using zebrafish *Danio Rerio* embryos and larvae. To explore the potential developmental toxicity of Remazol Black B dye, new fertilised zebrafish eggs were exposed to various concentration of dye solution (control, 1.56 mg/L, 3.12 mg/L, 6.25 mg/L, 12.5 mg/L, and 25 mg/L) until 96-hour post fertilisation (hpf). The developmental changes of the embryo and larvae zebrafish were compared between each concentration and control. At specified stages (8, 12, 24, 48, 60, 72, and 96 hpf), coagulation of egg, tail detachment, lack of somite formation and heartbeat, mortality rate and hatching as well as non-lethal malformation like skeletal deform, swim bladder defect or formation of yolk sac edema were described in detail. The results demonstrated that there was a significant difference on developmental change of zebrafish embryo when exposed to various levels of concentrations of Remazol Black B dye solution. There was significant difference on a mortality rate between embryo treated with highest concentration and control samples. However, the levels of concentration were still non-toxic to human. The concentrations may be hazardous to other organisms for example aquatic organisms.

FORENSIC APPLICATION USING HANDHELD RAMAN ANALYSIS

Wong Chee Ping

Agilent Technologies Sales (M) Sdn Bhd

Abstract: Conventional handheld Raman systems are typically limited to operation through clear plastic bags or clear glass vials. If materials are concealed behind thicker, coloured or opaque barriers, it is necessary to open and take a sample. In hazardous material response scenarios, opening or disturbing containers can increase risk to the operator, and in some cases, the public. Taking samples are also unnecessarily and potentially disturb crime scene evidence. Agilent handheld Raman Spectrometer is equipped with unique SORS technology. SORS is a derivative of Raman spectroscopy that enables high quality Raman spectra of the contents of opaque packaging to be measured in seconds for an effective non-invasive material ID. In SORS, two spectra are measured at different laser excitation positions on the container. The zero offset spectrum is collected at the same place where the light is detected, and the offset measurement is collected after redirecting the laser some millimetres away. A scaled subtraction of the two spectra allows the container spectrum to be removed, leaving only the contents spectrum for analysis. The SORS Raman spectrum, which is free from background or container spectrum, is then matched against a reference for identification and verification. This handheld Raman Spectrometer's through-barrier capability enables response teams to identify container contents early in an operation prior to escalation. This allows information about a situation to be gathered quickly and efficiently, enabling better critical decision making.

INTRODUCTION TO CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR AND EXPLOSIVE (CBRNE)

Ahmad Shamsul Irwan Bin Mohd Zaki

Department of Chemistry Malaysia (KIMIA)

Abstract: Chemical, Biological, Radiological, Nuclear and Explosive materials, or CBRNe have been used as weapons in mass destruction or terrorism events. This presentation provides an overview of the types of CBRNe weapons and how they are used. Examples of main chemical and biological weapons are discussed. Radiological weapons that spread radiation such as dirty bomb, as well as nuclear weapon are briefly described. The use of explosive as in improvised explosive device in domestic crime or terrorism is also highlighted.

while no phenolic acids were detected from H3 sample. This may indicate the absence of targeted phenolic acids or present in a very minute amount that give insignificant nutritional values. As an efficient method with LOD values down to low $\mu\text{g/g}$ level, it is anticipated to be a great analytical tool for revealing the raw pure *Trigona spp.* honey from any adulterated honey.

NEW ANALYTICAL TECHNIQUE IN DETERMINING PHENOLIC ACIDS IN KNOWN RAW PURE AND PURPORTEDLY PURE STINGLESS BEE HONEY

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Abstract: Honey adulteration is no doubt a concern to consumer and quality regulatory bodies. Addition of low-price honey into high-price honey is often seen in the market. In this work, a graphene-magnetite-based (G-Fe₃O₄) in-house sorbent was utilised for magnetic solid phase extraction (MSPE) of two phenolic acids, namely 4-hydroxybenzoic acids (4-HB) and protocatechuic (3,4-DHB) acids, unique to stingless bee honey samples prior to high performance liquid chromatography with ultraviolet detector (HPLC-UV) analysis. Optimum MSPE conditions for extraction of phenolic acids were 50 mg of G-Fe₃O₄ adsorbent, vortex rotational speed of 1600 rpm, 5 min extraction time, 30 mL sample volume at pH 0.5, 200 µL methanol as desorption solvent (5 min sonication assisted) and 5% w/v NaCl salt. Matrix matched calibration was used and the calibration graphs were linear in the range 5–30 µg/g (R²= 0.9996) for 3,4-DHB and 1–30 µg/g (R²= 0.9997) for 4-HB. Limit of detection (LOD= 3 S/N) calculated for 3,4-DHB and 4-HB was 0.138 and 0.083 µg/g, respectively. Good relative recoveries (76.19-112.46%) were obtained for both phenolic acids from honey samples with RSD < 9.86% (n= 3). The developed G-Fe₃O₄ MSPE method was applied to the analysis of both phenolic acids in honey samples from Johor Bahru, Johor, including two *Trigona* spp. Honey samples (H1 and H2) and one commercial honey sample (H3). The amount of 3,4-DHB and 4-HB in H1 sample was 0.63 µg/g and 0.13 µg/g, respectively. H2 sample showed slightly higher amount (1.50 µg/g for 3,4-DHB and 0.57 µg/g for 4-HB)

BIOTERRORISM: MALAYSIA'S PREPAREDNESS

SAC Dato' Hussein Omar Khan

Royal Malaysia Police (PDRM)

Abstract: The threat from bio-crime or bioterrorism - the malicious use of bacteria, viruses or toxins to threaten or cause harm to human, animals or agriculture is growing with many criminal or terrorist groups' demonstration with interest in obtaining biological materials and used as weapons. This threat has become more apparent with many countries increasing their preparedness in areas of biosecurity, biosafety, critical infrastructure response and bio-risk mitigation. This presentation will discuss Malaysia's readiness and preparedness to investigate such crime or attack.

FORENSIC GOES GREEN: DEVELOPING LATENT FINGERMARKS USING NATURAL WASTE

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Abstract: Rice husks are by-products generated during the milling of rice and are considered to be an agricultural waste. These waste products are generated in tonnes and their disposal poses environmental and health hazard. Rice husks primarily containing lignin, cellulose and silica have been used as precursor to synthesising silica and cellulose based nanomaterial. In this research, nanosilica and nanocarbon have been simultaneously fabricated from rice husk possessing traits that are beneficial for latent fingermark development with high clarity and contrast. Spherical and nanosized minimally agglomerated nanoparticles from rice husks were used in the form of powder and suspension for development of latent fingermarks on various surfaces to determine the sensitivity, selectivity and stability of these nanopowders. Four products, namely white nanosilica powder, black nanocarbon powder, multicoloured nanosilica powder and nanoparticle reagent were formulated for the use on surfaces with different properties. Nanopowders and reagents exhibited highly selective interaction with the fingermark residue as compared to commercial products. This study demonstrated that a sustainable, facile and eco-friendly method can be incorporated into fingermark development for forensic investigation that also allows for enhanced visualisation in terms of definition, sensitivity and selectivity.

RECOVERY STUDY OF IGNITABLE LIQUID FROM MOLOTOV COCKTAIL BOTTLES

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Abstract: Molotov cocktail is an incendiary device commonly used to commit arson. The burning of gasoline from Molotov cocktails might alter its chemical composition, and therefore, the chances for recovering gasoline residue from Molotov cocktails could be a challenge for forensic investigators. This research is aimed to study the recoverability of gasoline residue from Molotov cocktail bottles and the remnant of ignition cloths and adhesive tape after burning. In this study, fourteen Molotov cocktails were prepared. Six successfully ignited Molotov cocktails were subjected to burn completely and another six were extinguished using water after one minute of burning. The remaining two Molotov cocktails were failed to be ignited. The trace residue from glass bottles and cloths remnants were collected and analysed using gas chromatography technique. This study found that gasoline residue recoverability from both glass fragments and cloth remnants was the highest in unburnt Molotov cocktails, followed by extinguished and completely burnt Molotov cocktails. Gasoline profile from cloth remnants was better than from glass fragments. In conclusion, gasoline residue had higher chance to be recovered from unignited and extinguished Molotov cocktails. For completely burnt Molotov cocktails, the cloth remnants could be the more suitable medium to collect gasoline residue.

AUTHENTICITY STUDY OF PERFUMES USING GAS CHROMATOGRAPHY-MASS SPECTROMETRY (GC-MS) AND HIERARCHICAL CLUSTER ANALYSIS (HCA)

Nor Najwa Syazwani Binti Mohd Fazli & Wan Nur Syuhaila Binti Mat Desa

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Abstract: Counterfeit activities are considered as a serious problem in economic, social and political aspects. This will make consumer less confidence in legitimate product, destroys brands quality, company's reputation and may bring adverse health effect to consumers. The aim of this study is to examine of authentic and counterfeit perfumes based on its fragrance compounds using GC-MS and HCA. The perfume samples of Eau de Toilette (EDT) were used for this research. The samples were diluted to 20000 ppm and then analysed using GC-MS. GC-MS result revealed a good linearity of calibration curve with $R^2 = 0.99$ with LOD and LOQ value as low as 0.00070 ppm and 0.00212 ppm, respectively. The combination of GC-MS and HCA was used to discriminate between these two groups of similar samples. Fragrance compounds and additional compounds (possibly from adulterants) were identified using mass spectral database and the clustering of authentic and counterfeit perfumes were also presented by HCA. The TIC result showed the presence of additional peaks in counterfeit samples that would be adulterants. In conclusion, the result from these techniques have successfully showed separate grouping of samples according its originality at an acceptable degree of similarity with two misclassification of counterfeit perfume samples.

Keywords: perfume; fragrances compound; GC-MS; HCA.

IN THE LINE OF FIRE: PYROLYSIS PRODUCTS SPEAK

Gina Francesca Gabriel

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Abstract: Products generated through pyrolysis of common materials can act as background compounds, interfering the analysis and identification of potential human remains. The development of a robust methodology (indoor and outdoor) for the generation and analysis of volatile products from biological (porcine and human tissues) and non-biological (textile materials, wood, ILR) sources stands at the core of this study. Validation of porcine samples as a substitute of human samples through the identification of similar key indicators were conducted. Interestingly, different temperature ranges (pre- and post-ignition) and type of porcine tissues utilised were found to affect the key indicators. In addition, key indicators of pure and blended textiles were established and the effects of blended fibres towards the overall thermal properties of the textile was also highlighted. The study was also validated under outdoor conditions in Malaysia and further testing was conducted on the thermal decomposition of different types of wood and ignitable liquids. Overall, although this work suggests that pyrolytic data can be unpredictable, such as its dependence on various factors, with suitable analytical techniques, it has revealed pertinent information on the key indicators of porcine, human, textiles, wood and ignitable liquid samples, as well as the inter- and intra-molecular changes that occurred during pyrolysis.

THE CHALLENGES ON EXPLOSIVE DETECTION

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Abstract: The growing threat of terrorism activities has alerted the need for improved forensic analysis. Explosive, which is an energetic and exploded materials was used as an utmost material by terrorist for their inhuman actions. Bombing terrorism has alarmed forensic researchers and law enforcers to the exigency of forensic analytical techniques in order to counter terrorism. Complex matrix, limited samples and ambiguous interpretations have challenged forensic chemistry to link the evidence to the perpetrator of a crime. Therefore, this study will briefly discuss the screening techniques, sample extraction and analytical methods, as well as the importance of database development for the purpose of explosive detection.

DETECTION OF RESIDUAL GASOLINE IN SOIL FOR MOLOTOV COCKTAIL CASES USING GAS CHROMATOGRAPHY-FLAME IONISATION DETECTOR (GC- FID)

Nur Azira Hidayu Binti Azmi & Kah Haw Chang

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Abstract: The ability to identify and confirm the presence of gasoline traces in fire residue can act as the important evidence, especially for cases related to arson. Fail in detecting gasoline in fire residue could be due to the natural behaviour of gasoline that can easily vapourised. However, for porous surface such as soil, gasoline may have vapourised at the surface of soil whereas the rest could have been absorbed into the soil. In this perspective, this study focused on the detection of gasoline in soil at certain depth based on different phenomena of Molotov cocktail. In this study, Molotov cocktail was thrown to the soil and soil sample were collected depending on the depth of soil that has been set at approximately 5 cm. All soil samples were analysed using Gas Chromatography-Flame Ionisation Detector. In this study, soil samples that were collected at the top layer of soil showed the highest detection of gasoline for phenomena of fully ignited Molotov cocktail. For phenomena of ignited Molotov cocktail subjected to water extinguishment, the detection of gasoline was the highest at the middle layer of soil (2-4 cm) whereas Molotov cocktail failed to ignite showed the highest at the top layer of soil. Therefore, the results from this study suggested that the fire investigator should collect the soil sample at certain depth after fire, in order to increase the detection of gasoline in fire residue, and therefore proved an arson case.

**DISCRIMINATION OF HEAVY PETROLEUM DISTILLATE
(HPD) PRODUCTS USING GAS CHROMATOGRAPHY-MASS
SPECTROMETRY (GC-MS) AND CLUSTER ANALYSIS**

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Abstract: In forensic fire investigation, diesel, kerosene and jet fuel are classified as heavy petroleum distillate (HPD) products. The aims of the study were to compile chromatograms of fresh and weathered HPD fuels using chromatographic pattern and to identify discriminating compound in the three types of HPD fuels. Five samples, namely two diesel, two kerosene and one jet fuel were gradually weathered to the desired degree of evaporation (by weight) and were diluted to 2% v/v using dichloromethane (DCM). Substrates exposed with fuels were also prepared by burning plastic mats with three types of HPD fuels and then washed with DCM. All prepared samples were analysed using GC-MS. Result of Total Ion Chromatogram (TIC) pattern of the samples were obtained for comparison while data from TIC was applied for HCA. HPD fuels could be distinguished by the chromatographic pattern and HCA dendrogram. In HCA, all samples of the same type were correctly clustered with high degree of similarity (80%). Discriminating compounds that differentiate diesel with kerosene and jet fuel were identified as pristane and phytane. Three types of HPD fuels were successfully differentiated using pattern recognition of GC-MS and HCA technique.

JUVENILE CRIME: THE REASONS I DID IT

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Abstract: A plethora of criminological studies have investigated a wide range of psychosocial factors in explaining adolescents' involvement in delinquency and crime. The present findings seek to fill in the knowledge gap by understanding the criminogenic motivations in delinquency from the juveniles' perspective. Following this, a phenomenological approach was used with a qualitative data collection strategy. A total of 18 male participants, who were drawn from the delinquent population in one of the constitutional institutions in Peninsular Malaysia voluntarily participated in this study where face-to-face interviews were conducted using a semi-structured interview guide: Psychosocial Risk Assessment for Youth-Interview Guide (PRAY-IG). Participants' admission into the correctional admission was due to various types of offences such as burglary, drug smuggling and distribution, drug abuse, rape, and murder. In-depth information revealed two main criminogenic motivations underlying their involvement in crime; pecuniary and psychological motivations. Participants' initial involvement in delinquency can be rooted to monetary return and pure exploration. However, further involvement in criminal activity was perpetuated by greater monetary return, addictive sensational seeking and supported delinquent behaviours. Findings in this study provide better understanding on the mechanism of how delinquent behaviours are introduced, learnt, and reinforced through a socialization process with delinquent peers. Through these findings, there are implications on refining cognitive reasoning skills among juvenile delinquents as a strategy to reduce repeat delinquent behaviour. Additionally, building strong social support systems as part of rehabilitation program is equally crucial as it serves as basis for emotional and psychological support in deterring delinquency.

Keywords: criminology; juvenile delinquency; phenomenology

EMERGENCE OF NEW PSYCHOACTIVE SUBSTANCES IN MALAYSIA

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Abstract: In recent years, the emergence of potentially dangerous new psychoactive substances (NPS) that are not under international control has led to their abuses, hospital emergency admissions and sometimes fatalities globally. Six years since the Narcotics Division, Department of Chemistry first warned of the emergence of NPS in Malaysia, the appearance of such drugs continues to evolve. This presentation will highlight categories with regard to the types of NPS found in Malaysia and provide an overview of Malaysia's efforts to control these substances under legislation.

STABILITY OF NIPA SAP (*Nypa Fruticans*) TREATED WITH CENTRIFUGAL AND MICROWAVE SYSTEMS

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Abstract: Sugar rich fluid of *Nypa Fruticans* sap is highly susceptible to spontaneous fermentation. This study examined the stability of Nipa sap treated with microwave of 900 W for 4 min and centrifuge technique at 3000 rpm for 5 min to analyse the physicochemical properties changes (pH and total soluble solid (TSS), and vitamin C content of Nipa sap. The effect of these analyses during two weeks of storage was also performed. After 2 weeks of storage, pH value recorded significant different ($p < 0.05$) result between the treated sample of centrifuge without microwave (CWM), microwave without centrifuge (MWC), centrifuge and microwave (CM) with the untreated (controlled) sample while total soluble solid (TSS) value also showed significant different ($p < 0.05$) result values between the treated samples; CWM, MWC, CM and controlled sample. However, the concentration of vitamin C did not recorded with significant different ($p > 0.05$) value between the treated samples (CWM, MWC and CM) and controlled sample. Therefore, centrifugation at 3000 rpm for 5 min and microwave at 900 W for 4 min were recommended for the treatment that could be used to control the stability of the Nipa sap for extension of the shelf life.

MULTI-TRACE METALS FINGERPRINTING OF MALAYSIAN STINGLESS BEE HONEY SAMPLES VIA INDUCTIVELY COUPLED PLASMA-OPTICAL EMISSION SPECTROMETRY (ICP-OES) AND ESTABLISHMENT OF GEOGRAPHICAL ORIGIN WITH CHEMOMETRIC TECHNIQUES

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Abstract: Multi-trace metals analysis of stingless bee honey samples was conducted with the aim of developing a reliable technique of tracing the geographical origin of honey. Eighteen trace metals were determined in stingless bee honey of *Heterotrigona itama* species, from different regions of Peninsular Malaysia (Kedah, Johor, Selangor and Pahang) and seasons (rainy, max temperature: 27.9°C and less rainy, max temperature: 35.6°C) via ICP-OES. Principal component analysis (PCA) was then applied to recognise the distribution patterns. While the first three principle components for rainy season (November 2016) accounted for 74% of variance, the same was only 67.6% during the less rainy season (February 2017). Moreover, linear discriminant analysis (LDA) was applied to perform further classification. With the used of LDA, cross-validation was improved to 93.8% and 79.2% during rainy and less rainy seasons, respectively. Our results clearly demonstrate the potential of PCA and LDA techniques for honey origin identification. Furthermore, multi-trace metals concentrations in stingless bee honey was found to be correlated with its geographical origin. Three trace metals, namely Al, Ni and Zn that present in both rainy and less rainy seasons were suggested to be marker elements in determining the origins of stingless bee honey.

Keywords: honey; stingless bee; geographical origin; spectroscopy; chemometric.

ABSTRACT FOR E-POSTER PRESENTATION

**AMPLIFICATION OF MITOCHONDRIAL DNA
HYPERVARIABLE REGION I FROM EXTRACTED DNA OF
BURNT TEETH SAMPLES AT DIFFERENT TEMPERATURES**

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Abstract: Teeth DNA can be useful for identification of burnt human remains. Mitochondrial DNA is more likely to be retrieved from burnt teeth as compared to nuclear DNA, with advantages of higher copy number and resistance to degradation. The study is aimed to verify the extracted DNA from burnt teeth samples at different temperatures and durations of exposure using mtDNA. Collected teeth samples were heated at temperatures ranged 200 °C to 800 °C for 30 minutes and 15 minutes in two separated groups. Phenol-chloroform was used for DNA extraction and two rounds of PCR amplifications using mtDNA Hypervariable Region I primer set were performed on the extracted DNA. Samples subjected to 200 °C and 300 °C for 30 minutes, and 800 °C for 15 minutes were successfully amplified, producing 414 bp bands. Most samples burnt at lower temperatures for 15 minutes failed to produce amplicons, possibly due to poor DNA quality. In nested PCR, samples burnt up to 800 °C for 15 and 30 minutes successfully produced 201 bp amplicons. This study showed that mtDNA can be amplified in samples burnt up to 800 °C, but influenced by factors such as DNA purity and extraction technique.

**DETERMINATION OF HEAVY METAL IN AGRICULTURE SOIL
AT DIFFERENT DEPTH BY USING ATOMIC ABSORPTION
SPECTROMETER (AAS)**

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Abstract: Heavy metals have become the benchmark for agriculture soil profiling. In this study, Cu, Cd, Cr, Pb and Zn were analysed from five different types of selected agriculture soil, namely palm oil, sugarcane, rubber, lime and banana using Atomic Absorption Spectrometer (AAS). Five locations involving two districts in Kelantan which are Tanah Merah and Bachok were considered and two different depths (10 cm and 20 cm) of soil were collected from respective locations. Acid digestion method was used as a sample preparation before analysing using AAS. The result showed that Cd was absent in all types of agriculture soil, except in palm oil. Cd level was found to be decreased when the depth went deeper. All selected agriculture soils were higher in Pb and Zn while lower in Cd. Cr was present in moderate amount in rubber, lime and banana soil. Those heavy metals are varied and no specific trend in different agriculture soils. The results also presented that the concentration heavy metals of 10 cm and 20 cm at the same agriculture soils differed from one another. The profile of agriculture soils from this study can be used by forensic scientists to analyse and narrow down the areas.

Keywords: heavy metals; agriculture soil; AAS

DETECTION OF BENZODIAZEPINES IN HUMAN URINE USING ENZYME MULTIPLIED IMMUNOASSAY TECHNIQUE (EMIT) AND THIN LAYER CHROMATOGRAPHY (TLC)

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Abstract: Benzodiazepines such as Midazolam and Oxazepam are psychoactive drug capable of altering the mind and are becoming more prevalent in clinical and forensic cases. A precise and accurate analysis of the drug and its metabolites is essential in aiding forensic investigation. This study enables the validation and optimisation of the sensitivity and specificity of enzyme multiplied immunoassay (EMIT) and thin layer chromatography (TLC) for the analysis of benzodiazepine in human biological matrices. In this study, hydrolysed and non-hydrolysed benzodiazepine drugs were prepared for analysis by subjecting part of the spiked urine sample to acid hydrolysis and the other without hydrolysis. In EMIT, detection of 1 mg/mL non-hydrolysed midazolam that spiked into human urine was based on the standard calibration curve and positive test results for midazolam in human urine sample could be obtained through EMIT with an estimated cumulative concentration of more than 1000 ng/mL. Prior to TLC, benzodiazepines with concentration of 1000 ng/mL spiked into urine were extracted by liquid-liquid extraction using petroleum benzene and reconstituted using methanol. Optimisation of TLC analysis was carried out by varying the solvent systems and visualising spray reagents. Solvent system with chloroform:acetone (8:2) was suitable for separation of hydrolysed oxazepam, while chloroform: methanol (9:1) was good for non-hydrolysed midazolam. To derivatize and visualise the results, Bratton-Marshall reagent was most suited for hydrolysed drugs, while acidified iodoplatinate reagent was best for non-hydrolysed drugs. Dragendorff spray reagent was used as well and was capable of derivatising both hydrolysed and non-hydrolysed benzodiazepine drugs under the same conditions but on a less sensitive level.

RELATIONSHIP OF BLOOD AND URINE ALCOHOL LEVELS IN POSTMORTEM SAMPLES AND PREVALENCE OF ALCOHOL LEVEL ABOVE LEGAL LIMIT IN HOSPITAL KUALA LUMPUR

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Abstract: High blood alcohol content have been associated with fatal accidents, trauma deaths and violence crimes. Alcohol concentration in a body is a question frequently raised in the court of law. Therefore, it is important to estimate the alcohol level which could cause impairment or even lethal. One issue faced by pathologist performing autopsy is inadequacy of blood sample to measure blood alcohol concentration (BLAC). In many instances, they are left with urine sample to interpret the alcohol level in the body. Hence, this retrospective cross-sectional study was conducted to interpret the relationship between BLAC and urine alcohol concentration (UAC). Out of 473 postmortem cases with blood or urine samples sent for alcohol analysis at Hospital Kuala Lumpur in 2016, 229 cases with both BLAC and UAC were analysed. Approximately 2.76% of cases detected urine alcohol while the blood alcohol was negative. There was a significant average difference between BLAC and UAC ($t_{46} = -4.638$, $p < 0.001$), however both were relatively strong and positively correlated ($r = 0.609$, $p < 0.001$). Regression formula could be represented using $BLAC = 71.326 + 0.437 (UAC)$ with $r = 0.609$. More than 50% cases with the detection of BLAC or UAC were related to the road traffic collision death. Prevalence of blood alcohol value above legal limit of 80 mg/100ml was 24.6% among 142 MVA cases which sent for BLAC analysis. The average ratio of UAC/BLAC for true positive of determined prevalence was 1.29 ± 0.22 .

Keywords: post mortem; alcohol concentration; alcohol ratio; prevalence

GENETIC POLYMORPHISM OF MINISATELLITE D1S75 LOCUS AMONG INDIAN ETHNIC GROUP OF PENINSULAR MALAYSIA

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Abstract: Application of minisatellite D1S75 as DNA marker for population genetic study needs the establishment of database. In this study, 31 Indian individuals were successfully genotyped. Result shows that 7 different alleles were identified, ranging from 170bp to 590 bp. Indian ethnic group showed higher percentage of homozygosity (80.65%) compared to heterozygosity (19.35%). The most frequent homozygote allele observed was allele 1, while alleles 4 and 1 were found as the most common heterozygote alleles observed in Indian ethnic group with heterozygosity value of 0.065 and 0.097, respectively. The genetic relationship between Indian ethnic groups with other world populations was assessed using principal component analysis (PCA) and dendrogram phylogenetic tree. The finding revealed that Indian ethnic studied was genetically closely related to Aboriginal Australian population rather than other seven distinct Indian ethnics from India (Kolam, Thoti, Konkanasthas, Nairs, Marathas, Muslims and Ezhavas).

ANALYTICAL STUDY OF KETAMINE IN SPIKED DRINK

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Abstract: Ketamine, being easily spiked into victim's drink, is one of the common drugs used to facilitate sexual assault. The spiked drink and container that suspected to be used by victim could help in forensic investigation. Therefore, liquid-liquid extraction (LLE) was used to extract ketamine from mineral water, and coupled with gas chromatography-flame ionisation detector (GC-FID) to quantify the amount of ketamine. Validation testing showed that the method was linear at correlation coefficient (R^2) of 0.9936 in the range of 15.62 to 500 $\mu\text{g}/\text{mL}$. The limit of detection (LoD) and limit of quantification (LoQ) were determined at 7.628×10^{-3} $\mu\text{g}/\text{mL}$ and 0.02288 $\mu\text{g}/\text{mL}$, respectively. The relative standard deviations (RSDs) for both intra and inter-day precision were less than 5% while the results for accuracy were less than 15% at quality control concentration levels. In spiked samples, the average recovery percentage for low and high-level spiked ketamine extracted from mineral water were reported at $70.34\% \pm 5.03$ and $60.66\% \pm 19.74$, respectively. However, the peak for ketamine residue was detectable but very difficult to quantitate. In conclusion, the analytical procedure of LLE coupled with GC-FID method was found to be useful to extract and quantify ketamine in spiked mineral water.

Keywords: recovery study; drug facilitated sexual assault; liquid-liquid extraction.

CASE STUDY: THE NICOTINE CONTENT IN 43 E-CIGARETTE LIQUID

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Abstract: Nicotine is categorised as a Group C poison in the First Schedule of the Malaysia Poisons Act 1952. It shall not be sold to any person except as a dispensed medicine by a licensed pharmacist or registered medical practitioner. Tobacco is the only exemption. Any person who sell nicotine product without license shall be guilty of an offence against the Section 13(a) of this act. Recently the Pharmacy Services Division of the Ministry of Health Malaysia has conducted a raid to the e-cigarette shops, or commonly known as “vape shops” in the market. Following that, the vape liquid samples were sent to the Forensic Toxicology Section of the Department of Chemistry, Sabah to analyse the nicotine content. The samples were diluted with methanol and analysed with High Performance Liquid Chromatography with Photodiode Array Detector. Nicotine was detected in all samples at the range of 0.4 to 17.3 mg/mL. In this study, we also found that the concentration levels of nicotine in 33 samples are less than their declared amount. Nine samples were found to be conformed to the declared amount, and one sample contained higher nicotine level than the amount it declared.

Keywords: vape; e-cigarette; nicotine

FIRST RECORD OF ERISTALINUS ARVORUM (FABRICIUS, 1787) (DIPTERA: SYRPHIDAE) FOUND ON A HUMAN CORPSE IN MALAYSIA

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Abstract: A body of an unknown female with multiple blunt traumas was discovered in May 2017 at Bukit Beruntung, Selangor, Malaysia. The partially skeletonised human remains were found within a shallow burial ground whereas the skull was exposed and present on the ground. The soil at the burial site was wet and the site was an open area in a forest. The remains were exhumed and sent to Hospital Sungai Buloh. During autopsy, nine insect larvae were collected from the skull interior and preserved in 70% ethanol. Microscopic examination revealed the mean length of larva was approximately 29.77 ± 7.24 mm, average width 3.51 ± 0.80 mm, and mean weight 0.09 ± 0.03 g. The larvae were greyish in appearance, each with a telescopic breathing tube (posterior respiratory process). These insect larvae were later identified using DNA barcodes as *Eristalinus arvorum* (Fabricius, 1787) (Diptera: *Syrphidae*), or commonly known as rat-tail maggots. In Malaysia, larvae of *Syrphidae* have rarely been reported on human corpses and the species was never being identified. Although the developmental duration and stages of these specimens could not be ascertained due to the lack of local data, colonisation of *E. arvorum* larvae was reported on human remains in Malaysia for the first time.

BITE MARKS ANALYSIS IN MALAYSIAN POPULATIONS WITH APPLICATION TO HUMAN IDENTIFICATION

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Abstract: Bite mark evidence is one of the evidence that have been significantly found in crime cases. Bite mark refers as the impression of the dental structure left on surfaces. Dental or odontological testimony has been disallowed in some cases due to lack of experience experts and lack of references or research done on the bite mark analysis. This study was done to determine the morphological structure of the human teeth collected from different ethnic groups in Malaysia, namely Malay, Chinese, Indian, Sabahan and Sarawakian. The impression was done on plasticine wrapped with plastic then it was casted using casting material. The width of each sample teeth was measured as well as the width of the maxillary and mandibular arches. The mean values and percentage of RSD between the maxillary arch and mandibular arches were calculated. The morphological structure of the teeth also was observed such as the alignment of the teeth. In conclusion, the width measurement of the teeth and the characteristics of the teeth of each individual are different from each other. This allows teeth to be used for individualisation as it is very specific.

FORENSIC DISCRIMINATION OF GEL INKS USING HYPERSPETRAL IMAGING COUPLED WITH CHEMOMETRIC PROCEDURES

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Abstract: The use of the forensic examination of inks on questioned documents has become common, and law enforcement agencies rely heavily on these techniques during criminal activities. In this study, thirty gel pen inks of two different colours *i.e.* blue and red of five different brands *i.e.* Pilot®, Stabilo® Kilometrico®, G-Soft® and Faber Castell® were analysed using Video Spectral comparator. In terms of discriminating similar coloured components between samples, this was achievable only on the basis of the % reflectance spectra. However, arguably, there was sufficient evidence to suggest that it may be possible to discriminate the samples using Principal Component Analysis (PCA). Most of the sample variance (99.2%) was accounted for by the first three Principal Components (PCs), and a score plot of PC1 against PC2 was sufficient to visually discriminate the samples into five clusters. The results of this study demonstrate that PCA can be used to objectively interrogate gel pen inks of similar colour and more importantly of different brands.

Keywords: forensic science; principal component analysis; gel pen inks.

EXPLORATORY STUDY OF INTER-PEN MODEL VARIATIONS OF BLUE GEL PEN INKS USING ATR-FTIR SPECTRA AND MULTIVARIATE STATISTICAL TECHNIQUES

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Abstract: Forensic ink analysis is one of the important forensic analyses that aims to establish forgery indicator from questioned documents. Grounded on the common sense that a document is usually prepared using one single source of ink (*i.e.* one kind of pen), detection of more than one type of pen inks deposited on the document suggesting the possibility of forgery. Due to commercial reason, a pen ink manufacturer (*i.e.* pen brand) seldom produces only one kind of pen inks (*i.e.* pen model). This pilot study aims to explore inter-pen model variations of three U&ME blue gel pen inks that marketed under three different model names, *i.e.* G-One, G-Two and G-Three. Organic profiles of the pen inks were acquired using ATR-FTIR spectroscopy followed by multivariate statistical techniques, *i.e.* principal component analysis (PCA) and linear discriminant analysis (LDA). Both the visual and statistical examinations reveal that G-One and G-Three pen inks are quite similar with each other but differed from G-Two pen inks. In conclusion, inter-pen model variations of the three U&ME blue gel pen inks are varied and can be elucidated via PCA and LDA.

ASSOCIATION OF TOXICOLOGY IN ROAD TRAFFIC COLLISION DEATH IN HOSPITAL KUALA LUMPUR

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Abstract: The number of people killed in Road Traffic Collision (RTC) worldwide is estimated to be approximately 1.2 million every year. Throughout Malaysia from 2008 – 2011, there was an average of 500 accidents per month involving fatalities and about 3% happened within the capital city. Traffic death index was in average of 3.50 for every 10,000 registered vehicles, and majority of them involving motorcars and motorcycles. However, there was lack of published articles on the prevalence of drug abuser that involved in RTC death within Malaysia. Therefore, we have defined our objectives through this retrospective cross-sectional study. All postmortem cases involving RTC death at Hospital Kuala Lumpur between 2014-2016 were studied, given that the blood, urine and/or other tissue samples of the drivers dead in RTC were sent for toxicology analysis and finalised results have reached medical officer in-charge. The prevalence of RTC cases with positive Drug of Abuse (DoA) was ultimately low at approximately 7.07%. Out of 37 cases, 29 were motorcyclists (78.4%) and the rest were pedestrian (16.2%) and pillion rider (5.4%). All the motorcyclists were Malaysian, mainly aged within 16 – 45 years old (69%), majority were males (93.1%), Malay (62.1%) and 58.6% of the collision were happened during day time (7AM – 7PM). Additionally, 5 out of 37 accidents were presented with positive alcohol level, ranging from 63 mg/100mL – 308 mg/100mL. The most common cause of death was multiple injuries and head and/or chest injuries. This study attested that there was negative relationship between type of cases and positive DoA results based on the Spearman Correlation statistical test. RTC cases were more towards negative DoA results compared to non-RTC cases with $r(1723) = -0.06$, $p < 0.05$. Victims were found to have consumed drug of abuse and/or alcohol in an intoxicated level which could have influenced the driving skill. Law enforcement agencies shall regulate and monitor road users to ensure and enforce safe driving without psychoactive substances, including alcohol, illicit drugs and illicit medicines.

Keywords: road traffic collision; drug of abuse; toxicology; postmortem

EXPLORING THE CHANGES IN FACIAL CREASE DUE TO ACUTE RESERVIST TRAINING

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Abstract: Facial crease changes are caused by intrinsic and extrinsic factors. The changes in facial crease morphology of Universiti Sains Malaysia (USM) students due to acute reservist training is one of the concerns as there are no previous study carried out in Malaysia. USM students that were involved in a month-long reservist training were the subjects of interest. The general objective of this study is to explore the changes in facial crease morphology of USM students due to acute reservist training. This study focuses on developing a facial crease grading scale for Malaysian adult population and to determine its reliability. The significance of this study is to give information to the people about facial crease changes among USM students that have undergone reservist training. The newly developed five-point scale for the nasolabial fold and infraorbital creases, as well as the newly developed three-point classes of horizontal forehead line were reliable when tested with weighted kappa statistical test. The Wilcoxon Signed-Rank test results showed that there was significant difference between facial crease before and after a month of reservist training. In conclusion, a month-long reservist training has led to the changes in facial creases of USM students.

DEVELOPMENT OF LATENT FINGERMARK ON NON-POROUS SURFACE USING EGGSHELL POWDER COATED WITH NATURAL DYE EXTRACTED FROM TURMERIC POWDER, HIBISCUS FLOWER AND HENNA LEAVES

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Abstract: Fingermarks are one of the most valuable physical evidence that are often encountered at the crime scene. The most common method performed to develop latent fingermark on non-porous surface is powdering method. This study attempted to investigate the effectiveness and the potential of natural dye-coated egg shell powders in developing latent fingermark in comparison to the commercial fluorescent powder. In this study, the natural dyes were extracted from turmeric powder, hibiscus and henna leaves, respectively. Five non-porous substrates were selected for deposition of the latent fingermarks, namely glass, aluminium can, aluminium foil, plastic book cover and rubber glove. The egg shell powder was coated with the natural dyes by physical adsorption. The latent fingermark deposited on the tested surface were then developed by the tested powders, respectively. The developed fingermarks were visualised and photographed under white light and Crime Lite with the wavelength 450-510 nm (Blue-Green) with yellow filter, and 350-380 nm (UV) with colourless filter. The results demonstrated that the natural dyes-coated egg shell powder were able to produce similar luminescence property as the commercial fluorescent powder. Majority of the developed fingermark by the natural dyes-coated egg shell powder were also of high quality with identifiable ridge characteristics on most of the tested surfaces. In conclusion, the natural dye-coated egg shell powder has the potential to develop the fingermark on the non-porous surface, and visualised under UV illumination and warrants further research.

**THE EFFECTS OF DIFFERENT WRITING POSTURE ON
WRITING POSTURE ON HANDWRITING AND SIGNATURE
AMONG ADULTS IN KLANG VALLEY**

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Abstract: Handwriting and signature is a writing done using a pen or pencil on the hand and it is a style or manner of writing by hand. The objective of this study is to determine the effects of different writing posture on handwriting and signature among the adults in Klang Valley. Samples of text and signatures were collected from 240 respondents with the aged group 20 to 50 years old, and were divided into 120 males and 120 females, respectively and produced in six postures, namely typical sitting position (SP), two different lying positions (LP1 & LP2), kneeling position (KP) and two standing positions (STP 1 & STP 2). The parameters were used to examine the samples included arrangement, connections, dimension, line continuity, consistency, spacing, slant, baseline, pen lift, loops, hiatus and alignment. One-way ANOVA Test was used to analyse the result. In this study, it was suggested that arrangement, slant, baseline, consistency, spacing, intra-word connection, alignment and loops showed statistically significant values, $p < 0.001$, for both male and female respondents.

**IS TOOTH RESTORATION OUTLINE UNIQUE FOR
COMPARATIVE HUMAN IDENTIFICATION PROCESS?**

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Abstract: The identification of human remains based upon the individualistic characteristics present in the teeth of different individuals plays a vital role in forensic science. In order to make dental evidence as a reliable source in legal context, a reliable evidence and technique should be used. Therefore, this study was carried out to evaluate the uniqueness of tooth restoration outline using Hirox KH-7700 Digital Stereomicroscope (HDM). A total of 50 restored frasco teeth were scanned using HDM and the images produced were saved in the library of the instrument. The images of the teeth were then randomised and a pairwise list was created. This pairs consisted of original and distractor tooth. The identity of original tooth was known by the observer and the identity of distractor tooth was masked by supervisor by recoding the name. Then, each pair on the list were compared using HDM by superimposing both the pictures. Based on the similarities or differences displayed by the superimposed pictures, the pairs were decided to be a match or not a match. With the help of HDM, the researcher successfully made 100% correct decision in matching the original and distractor teeth images. Based on the results obtained, the uniqueness of tooth restoration outline has been proven and it can be used in comparative human identification.

FACIAL TISSUE THICKNESS OF MALAYSIAN POPULATION BASED ON SKULL CT SCANS

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Abstract: Facial soft tissue thickness (FSTT) data is a basic requirement for forensic facial reconstruction. 50 Malaysian adults (34 males, 16 females) aged ranging from 18 to 50 years old who had undergone brain Computed Tomography (CT) in the Radiology Department, HUSM were randomly chosen. The exclusion of the subject's criteria includes any head traumas such as soft tissue deformities, postoperative changes, skull fractures and abnormalities. The measurement of FSTT was obtained for 14 landmarks (3 midlines and 11 bilateral anatomical landmarks). The mean age of males' subject was 32.4 ± 11.2 years while for females' subject was 35.2 ± 10.8 years. The results revealed that males have greater FSTT than females at all landmarks. The FSTT mean values of present work were compared to the previous findings of the Korean, Turkish, Taiwanese, Gujarati and Slovakia. Comparison of other FSTT reveals that the soft tissue depths differ among populations. Overall, the FSTT measurements collected in this research is useful as a database for the forensic craniofacial reconstruction of Malaysian adult faces.

Keywords: FSTT; CT scans.

GENDER DISCRIMINATION BASED ON RIDGE DENSITY IN MALAYSIAN CHINESE POPULATION

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Abstract: Fingerprint is unique to everyone even between genetically identical twins. For that reason, fingerprint is a reliable evidence to identify the potential perpetrator in forensic science practice. Nonetheless, individualisation of fingerprint could only be achieved via comparison analysis *i.e.* with the presence of suspect or using a comprehensive database. In practice, suspect is seldom identified at the initial stage of investigation and due to human right reason, there is no one comprehensive fingerprint database in every country. As a result, several studies have reported the feasibility of discriminating gender using fingerprint ridge density *i.e.* number of ridges across the diagonal within a 25 mm^2 region on the fingerprint. In this work, we report the differences between 50 Malaysian Chinese males and 50 females in terms of fingerprint ridge density. Results show that females tend to possess higher number of ridges than males. In conclusion, we have demonstrated the feasibility of using fingerprint in forensics in determining gender of individuals.

VISUALISING WET LATENT FINGERPRINTS: NANOBIOTECHNOLOGY APPROACH FOR FORENSIC APPLICATIONS

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Abstract: Fingerprints have been one of the robust and useful human identification tools in a forensic investigation as it can link an individual to a crime, location or an item. Pertinently, the application of fingerprints for human identification is attributable to its individuality, persistency and systematic classifications of general ridge patterns. Besides, retrieving potential forensic evidence purportedly with fingerprints in underwater investigation has always been an issue. This is largely because the visualisation of wet latent fingerprints constitutes one of the many challenging tasks that forensic investigators encountered at crime scenes, mainly because of its hidden nature. Although the use of small particle reagent has been routinely recommended, such usage should be reduced in view of its formulation containing certain hazardous compounds (titanium dioxide and molybdenum disulphide). Considering the necessity to visualise latent fingerprints for forensic purposes, exploring the greener nanobiotechnological-based formulation may be a promising path in fingerprint technology, as well as in criminal investigations.

CORRELATION OF ALCOHOL AND TOXICOLOGY ANALYSIS WITH URINARY BLADDER DISTENSION BY POST-MORTEM COMPUTED TOMOGRAPHY (PMCT): A VALIDATION STUDY

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Abstract: Urinary bladder distension is traditionally regarded as a sign of intoxication at autopsy; however, to date there is lack of literature to support this hypothesis. This study aims to correlate the alcohol and/or toxicological analysis with calculated urinary bladder volumes (UBVs) and its sensitivity as well as to test the validity of using radiologically calculated UBVs from CT images. All postmortem cases where blood and/or urine samples were sent for alcohol and/or toxicology analysis at Hospital Kuala Lumpur in 2016 were studied. Out of 485 cases, there were 127 postmortem cases retrieved with positive alcohol and/or toxicology results. Positive toxicology results referred to the detection of drug of abuse (DoA), including amphetamine type stimulants, opiates, cannabis and ketamine. UBV was calculated based on the equation used in ultrasonographic volumetry, namely $V = a \times b \times c \times 0.5$. These three parameters were well correlated with UBV and demonstrated a strong positive relationship. There was a significant positive correlation at low strength between alcohol concentrations and calculated UBV. There was also statistical significant correlation between urinary bladder distension on postmortem CT and cases of intoxication, especially for cases with positive alcohol detection. The average sensitivity was determined at 35.65%, slightly lower than the values reported in C. Rohner et al. (2013). Diuretics effect of alcohol could be deduced as the main reason that causes bigger urinary bladder or UBV and it was more prominent than the influence of DoA on the urinary bladder sphincter. The distension of urinary bladder should raise suspicion of intoxication, but would not provide information on the quantity of intoxicating agent due to its

significant but poor correlation. It was important to note that intoxication may also present in cases with low urinary bladder volume. In conclusion, it is vital to consider circumstantial evidence as well as the presence of additional findings on imaging before suggesting the diagnosis of intoxication based on urinary bladder distension. A complete autopsy and detailed toxicological analysis should be performed.

Keywords: urinary bladder distension; postmortem computed tomography; alcohol; toxicology; drug of abuse

DEGRADATION OF LATENT FINGERPRINTS ON GLASS SUBSTRATE SUBMERGED IN WATER

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Abstract: In the context of forensic sciences, fingerprints are important physical evidence for identifying potential suspect due to their uniqueness. However, a degraded fingerprint could be worthless to identification since the clarity of vital minutiae features is reduced. In such circumstance, it seems more relevant to study the fingerprint for estimating the time since the crime could have happened. The aim of this work is to investigate the degradation of fingerprint on glass substrate submerged in water over a period of 21 days. Degradation of fingerprint was defined by reduction of number of intact minutiae *i.e.* degraded minutiae ratio (DMR). In other words, a highly degraded fingerprint would be characterised by high DMR value or vice versa. Results show that the fingerprints demonstrate linear degradation rate only after 7 days of deposition, of which can be modelled using linear regression equation. Changes observed within the first 7 days are almost insignificant. In conclusion, our study has demonstrated the feasibility to estimate time since a latent fingerprint was deposited on glass substrate. Future study shall explore statistical and image analysis approaches in assessing the changes of fingerprint more precisely and focuses on other types of substrates.