FSSM
FORENSIC SCIENCE SOCIETY OF MALAYSIA

NATIONAL FORENSIC SCIENCE SYMPOSIUM 2024

18-19 SEPTEMBER 2024

AVANTÉ HOTEL
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MESSAGE FROM THE CHAIRMAN OF THE ORGANISING COMMITTEE

On behalf of the Organising Committee, I am pleased to welcome you to the National Forensic Science Symposium (NFSS) 2024 hosted by the Forensic Science Society of Malaysia (FSSM) in conjunction with our 16th Annual General Meeting.

As what we have done over the years, National Forensic Science Symposium provides a platform for professionals, practitioners, researchers, and academicians from the forensic science community to exchange their insights, views and experiences on the current and future developments for the advancement of forensic science services, research and innovation, as well as forensic education.

NFSS 2024 with the theme “Advancing Forensic Sciences” includes workshop organised by our industrial partner, and presentations from invited speakers, oral and poster presenters from various agencies and universities. We know the interdisciplinary nature of forensic science and the societal importance of forensic science. This symposium will certainly provide opportunities for deeper understanding and better communication among us. Please do not miss the opportunities to exchange information and contact details. We all know that networking is important to us, and therefore FSSM will continue to act as a facilitator to strengthen linkages among the key forensic science stakeholders.

We are indeed grateful to our gold sponsor, Geliga Sistem Sdn Bhd who has generously sponsored the event. Also not to forget Dutarini Sdn Bhd and XSpec Technology for the supports. Many thanks to the Director-General of KIMIA Malaysia and her presence to officiate our symposium. I sincerely appreciate the participants from KIMIA, PDRM, the universities, the hospitals, other public agencies and private institutions who have been supporting us since the establishment of FSSM. I am also thankful to our organising committee members who worked really hard to make this symposium a reality.

Have a wonderful time at the symposium. Thank you.

DCP (R) Dato’ Dr. Yew Chong Hooi
Chairman
Organising Committee NFSS 2024

ORGANISING COMMITTEE

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Scientific & Publication:	Assoc. Prof. Dr. Ahmad Fahmi Lim Abdullah
	Dr. Chang Kah Haw
	Dr. Aida Rasyidah Azman

PROGRAMME

18 SEPTEMBER 2024 (WEDNESDAY)

0830-0915	**Registration**
0915-0930	**Welcoming Speech** DCP (R) Dato' Dr Yew Chong Hooi *President of Forensic Science Society of Malaysia*
0930-0945	**Opening Speech and Opening Ceremony** Puan Marhayani binti Md Saad *Director-General, Department of Chemistry Malaysia*
0945-1030	**Plenary Session I**
	Forensic Pathologist Investigations in Determining the Cause of Death in Murder Case Dr. Siew Sheue Feng *National Institute of Forensic Medicine*
1030-1045	**Morning Tea Break**
1045-1245	**Scientific Session I**
	New Psychoactive Substance in Malaysia: Trends, Risks and Regulatory Gaps Noor Diana Binti Tahir *Department of Chemistry Malaysia*
	New Trend in Marketing Psychoactive Stimulants – Identification and Quantitation of Illicit Drugs and New Psychoactive Substances in Beverages Preparations Vanitha Kunalan *Department of Chemistry Malaysia*
	The Importance of Quality in Forensic Science Nor Aidora Saedon *Department of Chemistry Malaysia*
	Beyond Absence: Contamination In Forensic DNA Laboratory Nur Hafiza Binti Md Yusop *Department of Chemistry Malaysia*
	Compound Vs Simple Proposition in DNA Mixture Interpretation Zulhilmi Bin Husni *Department of Chemistry Malaysia*
	Allelic Variations in Edar Gene for Hair Type Prediction among Malaysian Population Chin Pei Ling *Universiti Sains Malaysia*
1245-1400	**Lunch**

1400-1520	**Scientific Session II**
	Discriminating Forest Soils Based on UHPLC Fingerprint and Principal Component Analysis for Forensic Provenance Nadirah Binti Abd Hamid *Universiti Kebangsaan Malaysia*
	Discrimination of Malaysian Gasoline Based on ATR-FTIR Fingerprinting using Pattern Recognition Methods Wan Nurdini Binti Wan Mohd Hassim *Universiti Kebangsaan Malaysia*
	Case Study: Fingernail Sample Expedites the Identification of Remnants from Homicide Case Erizasyira Binti Basri *Department of Chemistry Malaysia*
	The Kuala Koh Incident: A Case Study of Heavy Metals in Biological and Environmental Specimens Nurhazlina Hamzah *Department of Chemistry Malaysia*
1520-1535	**Afternoon Tea Break**
1535-1635	**Scientific Session III**
	Assessing Discriminative Capability of Volatile Organic Compositional Profile of Red Pen Inks for Forensic Ink Analysis Cherayna A/P Amnuai *Universiti Kebangsaan Malaysia*
	Decipherment of Charred Documents from Different Types of Printers using Chemical Methods and Video Spectral Comparator (VSC) Nurul 'Ain Abu Bakar *Management and Science University*
	Forensic Differentiation of White A4 Office Paper: A Synergistic Approach utilising ATR-FTIR Spectroscopy and Pattern Recognition Techniques Tay Eue Kam *Universiti Sains Malaysia*
End of Day 1	

PROGRAMME

19 SEPTEMBER 2024 (THURSDAY)

0830-0915	**Registration**
0915-1000	**Plenary Session II**
	Penyiasatan Forensik Angkasa *Mhd Fairos bin Asillam* *Bahagian Penguasa Angkasa, Kementerian Sains, Teknologi dan Inovasi*
1000-1030	**Talk Session**
	Visiting Scientist in Forensic Anthropology at the New York City Office of Chief Medical Examiner *Dr. Salina Hisham* *Department of Forensic Medicine, Hospital Sultan Idris Shah*
1030-1100	**Morning Tea Break**
1100-1230	**16th Annual General Meeting**
1230-1300	**Closing**
1300-1430	**Lunch**


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ABSTRACT FOR ORAL PRESENTATION

NEW PSYCHOACTIVE SUBSTANCE IN MALAYSIA: TRENDS, RISKS AND REGULATORY GAPS

Noor Diana Tahir*, Saravana Kumar, Maheswari Paliyanny, Ruhana Liyana Mohd Lawi, Vanitha Kunalan

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Abstract: This presentation describes the shifting patterns of New Psychoactive Substances (NPS) in Malaysia, focusing on recent changes from traditional forms such as tablets and plant material to sachets, beverages and other liquid forms, particularly within vape flavours. Such trend reflected broader global patterns and raising concerns for public health and safety. These products were found to have contained different groups of NPS, with synthetic cannabinoids being the most common. The increasing usage of synthetic cannabinoids in these products poses a significant challenge, as some of these substances have been gazetted under the Dangerous Drugs Acts 1952 and Poison Acts 1952, while others remain unregulated. By examining the trend, we aim to enhance the understanding and promote more effective responses to the challenges brought by NPS in Malaysia.

NEW TREND IN MARKETING PSYCHOACTIVE STIMULANTS – IDENTIFICATION AND QUANTITATION OF ILLICIT DRUGS AND NEW PSYCHOACTIVE SUBSTANCES IN BEVERAGES PREPARATIONS

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Abstract: Illicit drugs such as methamphetamine, 3,4-methyledioxymethamphetamine (MDMA) and ketamine usually present in the form of colorless crystal, powdery substances or tablets. However, since 2018 the Narcotics Division received cases in sachets form where drugs are mixed in beverages preparations. In some cases, new psychoactive substances (NPS) also identified in the samples. In this presentation analysis on identification and quantification of illicit drugs and NPS by gas chromatography mass spectrometry (GC/MS) and high performance liquid chromatography (HPLC) in beverages preparations from cases received in the laboratory will be discussed.

THE IMPORTANCE OF QUALITY IN FORENSIC SCIENCE

Nor Aidora Saedon*

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Abstract: The pursuit of quality in forensic science is paramount to ensuring the integrity, reliability, and credibility of forensic evidence in both criminal investigations and judicial proceedings. Forensic science operates at the intersection of law, science, and justice, where the accuracy and precision of scientific analyses will directly influence the outcomes of forensic cases. This talk encompasses critical importance of maintaining rigorous quality standards across forensic disciplines, highlighting the need for strict adherence to protocols, robust quality control measures, and continuous professional international accreditation. Failures in quality management can lead to irreparable miscarriages of justice, including wrongful convictions or the acquittal of guilty individuals. Moreover, as forensic technologies evolved, ensuring the validity and reproducibility of results becomes increasingly challenging, particularly in newly emerging fields. The credibility of forensic science hinges on the development and enforcement of standardized practices, comprehensive training, and the use of peer-reviewed methodologies. This talk will also cover on the future of forensic science with a commitment to quality assurance, ensuring that scientific evidence upholds the highest standards of reliability and impartiality, ultimately fostering greater public trust in the justice system.

BEYOND ABSENCE: CONTAMINATION IN FORENSIC DNA LABORATORY

Nur Hafiza binti Md Yusop*, Muhammad Hafiy bin Daud @ Laudek, Salina binti Mohd Isa, Aedrianee Reeza binti Alwi

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Abstract: Maintaining pristine working conditions is crucial in forensic DNA laboratories to prevent erroneous results and ensure casework integrity. This study investigated the prevalence and mitigation of DNA contamination on various benches within a forensic laboratory. Samples were collected from five locations, namely the serology, reference and crime scene extraction, pre-amplification, and post-amplification benches. While no DNA was detected on any bench except for the post-amplification area, an unexpected finding emerged a consistent allelic ladder profile, likely stemming from Allelic ladder reagent contamination. To overcome the specific contamination, readily available disinfection methods were evaluated using 3% commercial bleach, Termi-DNA-Thor, 95% ethanol, and a non-treated control. Among these, the commercial bleach demonstrated superior effectiveness, completely eliminating the allelic ladder profile from the contaminated surfaces. These findings highlighted the importance of regular decontamination, particularly in post-amplification areas, while suggesting readily available bleach as a potent and readily available tool for mitigating specific DNA contamination concerns. This study underscores the need for ongoing vigilance and adaptation of contamination control strategies, emphasizing the evaluation of readily available options for efficient and effective decontamination in forensic DNA laboratories.

COMPOUND VS SIMPLE PROPOSITION IN DNA MIXTURE INTERPRETATION

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Abstract: In the context of presenting DNA evidence in court, two approaches are commonly used to explain DNA matching in mixture evidence: compound propositions and simple propositions. A compound proposition involves considering two or more persons of interest simultaneously as potential contributors to a DNA mixture, while a simple proposition evaluates each individual separately. From a layperson's perspective, the compound proposition may seem more intuitive and easier to understand. However, limitations in DNA interpretation challenge the practical application of compound propositions in evidence presentation. This presentation explores the principal and empirical findings related to both compound and simple propositions in greater detail.

ALLELIC VARIATIONS IN EDAR GENE FOR HAIR TYPE PREDICTION AMONG MALAYSIAN POPULATION

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Abstract: Forensic DNA phenotyping is a sophisticated forensic science approach, allowing for the prediction of external visible characteristics (EVCs) from biological evidence found at crime scenes. This study focused on predicting hair structure among the Malaysian population by analysing the EDAR gene, which known to influence hair morphology in Asian populations. Despite advancements in DNA profiling with short tandem repeats (STRs), challenges persist due to trace amounts, contamination, and limited reference samples in forensic databases. This research characterised the single nucleotide polymorphism (SNP) variations within EDAR gene associated with different hair types—straight, wavy, and curly. Sixty (60) buccal swab samples from both male and female subjects aged 18 and above were collected, with 20 samples representing for each hair type. Sanger sequencing identified three distinct alleles at SNP rs3827760: A, G, and a combination of both. Results showed a substantial correlation between the A allele and curly hair along with the G allele and straight hair, with a *p*-value of 0.0001. Wavy hair exhibited a uniform distribution of the three alleles. Significant ethnic variation was also observed; 94.4% of Chinese participants carried the G allele, while 85.7% of Indian participants had the A allele. The Malay and other ethnic groups showed a relatively even distribution of alleles. The association between ethnic groups and SNPs was statistically significant, with a *p*-value of 1×10^{-6}. This study highlighted the utility of SNP rs3827760 in predicting hair structure and distinguishing ethnic groups, hence contributing valuable insights to forensic DNA phenotyping.

DISCRIMINATING FOREST SOILS BASED ON UHPLC FINGERPRINT AND PRINCIPAL COMPONENT ANALYSIS FOR FORENSIC PROVENANCE

Nadirah Abd Hamid[a], Hukil Sino[a], Nur Anisa Binti Mohd Rashid[b], Loong Chuen Lee[a]*

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Abstract: Soil is one of the commonly found evidence in various type of crime cases especially for those occur at outdoor. Due to its complexity, there has been increasing work dedicated in developing methods for forensic soil analysis, with a purpose to determine if the questioned samples collected from the victim or crime scene and the known samples obtained from the suspect are of the same source. By this, one can establish the link between the suspect and the victim. Such analysis is usually accomplished *via* a comparison analysis. However, in a case with the absence of either questioned or known sample, provenance analysis is more suitable to be applied. This work explores the inter-site variations of 37 Malaysian soils based on ultra-high performance liquid chromatography (UHPLC) fingerprint and chemometric methods. The soils were collected from two different sites (BR and BW) in the state of Selangor, Malaysia. The samples were prepared through organic extraction and injected in triplicate into a UHPLC system. Eventually, 111 chromatograms were obtained and explored for inter-site variations by principal component analysis (PCA). Based on score plot of PCA, the two sites were well separated in the global and sub retention time windows. Moreover, the intra-site of BR was higher than BW. In conclusion, UHPLC fingerprint could be used to discriminate soils by sites within the same state.

DISCRIMINATION OF MALAYSIAN GASOLINE BASED ON ATR-FTIR FINGERPRINTING USING PATTERN RECOGNITION METHODS

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Abstract: Forensic discrimination of fuel could contribute to arson investigations and smuggling of fuels. Gasoline being one of the most common type of fuel is essentially a complex mixture of organic compounds. Hence, attenuated total reflectance-Fourier transform infrared (ATR-FTIR) spectroscopy has been demonstrated useful in profiling gasoline. This work aims to evaluate variations of Malaysian gasoline based on the IR fingerprints. Six gasoline samples covering RON95 and RON97 were purchased from three local pump stations in Shah Alam, Selangor, Malaysia. Eight IR spectra were accumulated for each gasoline by placing eight independent fresh drops on the ATR crystal. The resulting 48 IR spectra were then explored by principal component analysis (PCA) and hierarchical clustering analysis (HCA). The BHP gasoline could be discriminated by RON qualities. On one than, RON95 of BHP gasoline samples were clustered together regardless of the locations of petrol stations. Meanwhile, both RON97 of BHP gasoline samples were highly similar with the two Shell gasoline samples. In conclusion, IR fingerprints of gasoline could be useful in discriminating gasoline from different sources.

FINGERNAIL SAMPLE EXPEDITE THE IDENTIFICATION OF REMNANTS FROM HOMICIDE CASE: CASE STUDY

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Abstract: A homicide case was brought in for DNA profiling. The samples were collected from a shallow grave where the body was found buried for over a year. The primary effort was to establish the identity of the remains as well as to find any link of the perpetrator to the crime committed. Among the exhibits submitted were fabrics remnants, fingernails, and right femur bone. PrepFiler Express BTA™ on AutoMate Express™ instrument and phenol-chloroform extraction methods were utilised to extract the DNA from bone and fingernail. Due to the highly degraded condition of the bone and fingernail samples, the DNA profiling was only successful on fingernail sample extracted with organic method and no success with bone extracted with both PrepFiler Express BTA and phenol/ chloroform extraction methods. A partial male autosomal STR DNA and Y chromosomal STR DNA profiles were both developed from the fingernail sample.

THE KUALA KOH INCIDENT: A CASE STUDY OF HEAVY METALS IN BIOLOGICAL AND ENVIRONMENTAL SPECIMENS

Nurhazlina Hamzah*, Sharmilah Kuppusami, Ayub Ismail

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Abstract: The Kuala Koh incident involved the deaths of 16 Orang Asli from the Batek Tribe in Kampung Kuala Koh, Gua Musang, in June 2019. A total of 27 cases with 71 exhibits, including biological specimen, soil, and water, were analysed by the Toxicology Division of the Department of Chemistry, Malaysia. The analyses included determination of heavy metals such as aluminum (Al), cadmium (Cd), copper (Cu), lead (Pb), zinc (Zn), arsenic (As), and manganese (Mn), organophosphate and organochlorine pesticides, paraquat and common drugs. Detecting manganese was the primary focus as it was believed that the river water was polluted by the manganese mining activities. The results showed that manganese levels in soil samples were within normal ranges. However, elevated levels of manganese were found in some hair and nail samples. Despite this, no conclusive evidence was found linking manganese exposure to the deaths. In July 2019, another set of specimens was submitted by the Ministry of Health (MOH) for monitoring purposes. A total of 25 cases with 54 exhibits of different specimen (e.g., liver, kidney, nails, hair and soil) were tested for various heavy metals. The analyses showed that the heavy metal levels in these samples were within the normal range, while certain hair, nail and soil samples showed increased concentrations of Al, Cd and Mn. The incident highlighted the challenges in assessing heavy metal exposure in forensic contexts and the need for robust data to determine lethal levels accurately. After much speculation, the MOH announced in September 2019 that the cause of mass deaths was measles .

ASSESSING DISCRIMINATIVE CAPABILITY OF VOLATILE ORGANIC COMPOSITIONAL PROFILE OF RED PEN INKS FOR FORENSIC INK ANALYSIS

Cherayna Amnuai, Norwahida Zamani, Hukil Sino, Loong Chuen Lee*

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Abstract: The goal of forensic ink analysis is to identify the origin, legitimacy, and age of ink samples through examination and comparison analysis. This is typically accomplished through an analytical instrument coupled with chemometric methods. This study aims to explore the discriminative capability of Gas Chromatography-Flame Ionisation Detector (GC-FID) technique in discriminating ten types of red ballpoint pen inks assisted by various multivariate exploratory tools. To build a representative data set, red ballpoint pens of 10 types were purchased from a local stationery shop. The spatial clustering of the pen inks elucidated using score plot of principal component analysis (PCA) revealed that inter-pen brand variation was higher than the inter-pen type variation. Furthermore, hierarchical clustering analysis (HCA) successfully discriminated nine out of ten pen types and all five pen brands. The outcome of the study provided a vital insight into utilising the volatile organic profiles in discriminating red pen inks sold in Malaysia.

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DECIPHERMENT OF CHARRED DOCUMENTS FROM DIFFERENT TYPES OF PRINTERS USING CHEMICAL METHODS AND VIDEO SPECTRAL COMPARATOR (VSC)

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Abstract: Due to the invention of digital devices, the usage of printed documents in the form of proof, agreements, cheques, vouchers, bills and various other documents developed from non-impact printers including inkjet printers, laser printers and photocopiers has increased. For safety purposes, important documents are stored in the filing cabinets and might not be saved in the servers or the cloud. When the fire incident happens, the decipherment method of charred document becomes the only way to restore the vital information on the document. This study was aimed to explore on the effects of different non-impact printing mechanisms on charred documents and compare the chemical and instrumental decipherment methods of printed matter on charred documents. A total of 20 printed documents were prepared from different printer (inkjet printer, laser printer and photocopier) and stored in stainless-steel containers. Then, the stainless-steel containers were heated using charcoal in a clay pot for 2 hours to char the document. The charred documents were deciphered using the video spectral comparator (VSC) method, silver nitrate method and alcohol-glycerin method. A total of 15 and 5 charred documents from the inkjet printer were visible and faintly visible respectively before applying the decipherment method. VSC method could decipher all the charred documents visibly while the alcohol-glycerin method made the printed matter worse. VSC is the best method to decipher the printed matter of charred documents.

FORENSIC DIFFERENTIATION OF WHITE A4 OFFICE PAPER: A SYNERGISTIC APPROACH UTILISING ATR-FTIR SPECTROSCOPY AND PATTERN RECOGNITION TECHNIQUES

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Abstract: In forensic investigations, paper analysis is crucial for authenticating documents, determining forgeries, and linking evidence to specific sources. By examining the paper's physical properties and chemical compositions, forensic document examiners (FDEs) can verify the legitimacy of documents and detect alterations or counterfeit materials. Such analysis also helps tracing the paper's origin by identifying unique features, eventually connecting documents to specific locations or manufacturers. The aim of this study was to explore the feasibility of using attenuated total reflectance-Fourier transform infrared (ATR-FTIR) spectroscopy, a non-destructive analytical technique, in tandem with pattern recognition techniques to differentiate white A4 office paper from various brands. In this preliminary investigation, infrared spectra of white A4 paper from ten different brands (n=10) were acquired by scanning in the range of 4000 cm^{-1} to 600 cm^{-1}. Following data pre-processing, the resultant spectra were then analysed using pattern recognition techniques, specifically principal component analysis (PCA) and linear discriminant analysis (LDA). The initial assessment demonstrated that the papers could be grouped based on their brands, indicating the potential effectiveness of this combined method for differentiating white A4 office paper from different manufacturers. For future research, more samples will be analysed to further validate the potential of this synergistic approach. Additionally, its application in real forensic document casework will be explored, enhancing its practical utility in forensic investigations.


GELIGA SISTEM
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ABSTRACT FOR POSTER PRESENTATION

NOVEL APPROACH IN FORENSIC INK ANALYSIS: LEVERAGING SELF-ORGANISING FEATURE MAPS (SOFM) FOR BLACK GEL INKS DISCRIMINATION

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Abstract: Artificial neural networks have captured the attention in the field of forensic science due to their ability to act autonomously of the assumptions that based on varieties of quantitative techniques. Current forensic analysis of gel pen inks involves the use of non-destructive techniques such as attenuated total reflectance infrared (ATR-FTIR) spectroscopy in tandem with the chemometrics technique such as principal component analysis (PCA). The main drawback associated with PCA is that the clusters formed within it become convoluted as the sample sizes increase, making the discrimination and deciphering information about the samples impossible or extremely challenging. In this study, the potential of novel self-organising map features (SOFM) neural network was evaluated to classify various brands of black gel pen inks from different manufacturers. Thirty (n = 30) different brands of black gel inks procured from 23 different manufacturers locally and internationally were first analysed using ATR-FTIR spectroscopy and their resultant IR spectra were pre-processed followed by SOFM analyses. The SOFM output was shown to correlate closely to the prior knowledge obtained with similar samples positioned closely to each other. The outcomes demonstrated that SOFM has effectively discriminated the black gel ink samples by establishing 25 clusters in the u-matrix mapping in accordance with the number of manufacturers of the tested inks. Furthermore, it has also successfully separated the pigment-based and dye-based black gel inks. The results of this study signify that the SOFM neural network has the potential to serve as an effective alternative tool for forensic document analysis involving black gel inks.

FIRST ATTEMPT FOR TRIPLE INSURANCE OF TWO PARTIES' HARD COPY DOCUMENTS AUTHENTICATION

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Abstract: Millions of documents are produced daily, and these daily use documents need to be secured. The rapid progress in the last decades proposed a new challenge in security. The crime of forgery is one of the serious crimes that has spread in the countries of the world, threatening the stability of public confidence in official and customary documents. It disturbs transactions and other aspects of legal life in society, as people rely on hardcopy official and customary documents to prove their relationships, legal positions and rights through written evidence. Statistics indicate a high rate of forgery in various ways that had created many challenges to secure important documents, leading to a problem of integrity, trust, and authentication of hardcopy documents. Therefore, it is important to have a system that could verify a hardcopy document and ensure that its integrity is maintained at all times. In addition, researchers tend to evolve new methods to secure documents. However, securing documents is a very hard task, due to the diversity of forgery methods, the evolution of technology used in forgeries such as computers, printers, inks, paper, and the availability of other tools necessary to complete the task. Researchers had developed many technologies and techniques to secure documents and the most recent development methods used to enhance security is by using human biometric characteristics along with the classic verifying method. In this study, new methods were used to enhance hardcopy document security, including classic authentication by signature and the use of a fingerprint, but using human blood rather than ink on FTA documents of any two parties' documents, such as contracts and checks. It formed a triple authentication consisting of handwritten documentation by signature and double uniqueness using a thumbprint and DNA fingerprint present in the blood.

THE INVESTIGATION OF A RARE CASE OF HETEROPATERNAL SUPERFECUNDATION IN MALAYSIA BY DNA PROFILING TECHNIQUES: A CASE REPORT

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Abstract: Heteropaternal superfecundation is a rare phenomenon where a woman conceives multiple offsprings from different fathers within a single menstrual cycle. This occurs when two separate sperms from distinct men fertilise different eggs released during ovulation. Such cases highlight the complexities of human reproduction and genetic diversity. While the phenomenon is uncommon, it can lead to significant implications for paternity testing and family dynamics. Following a request for private paternity testing, DNA profiling analysis was carried out on blood specimens of the tested individuals using commercial polymerase chain reaction (PCR) amplification kit consisting of 21-autosomal STR markers and 3 gender markers (Amelogenin, Y-indel and DYS391). Upon identification of anomalies, further profiling was carried out using Next Generation Sequencing (NGS) analysis with over 200 markers, including autosomal, X- and Y-STRs and biogeographical ancestry information.

STATURE ESTIMATION FROM HANDPRINT AND FOOTPRINT ANTHROPOMETRY IN THE ADULT PUNJABI POPULATION IN PENINSULAR MALAYSIA

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Abstract: The estimation of stature of an individual based on a handprint or footprint found at a crime scene is a vital aspect of forensic investigations. This research studied the correlation between individual stature and the length and breadth of handprints and footprints among the Punjabi population in the Peninsular Malaysia. Ninety Punjabi adults, both males and females from Peninsular Malaysia, aged between 18-50 with no physical disabilities participated in the study. The stature of each participant was recorded. Left and right handprints and footprints were collected by lightly pressing ink-stained hands onto paper, and subsequently scanned and saved as PDF files. From the scans, 16 measurements were taken from each handprint and 6 measurements were taken from each footprint. An independent T-test found that bilateral asymmetry was statistically significant (p< 0.05) between right and left handprints and footprints between males and females. There were positive correlations between stature, handprint and footprint measurements (r= 0.572 – 0.823, p<0.05). Multiple regression equations were then developed for stature estimation from handprint and footprint measurements in the Punjabi adult population. The regression equation to estimate individual stature for males was established as Stature = 51.453 + 0.496 × OPRT2 (r^2= 0.678, p<0.05); while for females as Stature = 56.127 + 0.549 x OPRT5 (r^2= 0.509, p<0.05). It was concluded that stature couold be determined from handprint and footprint measurements using population specific data.

ACCELERATING DNA EXTRACTION FROM BONE SAMPLES WITH OPTIMIZED INCUBATION TIME USING THE EZ1&2™ DNA INVESTIGATOR® KIT VIA EZ2® CONNECT FX

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Abstract: Bone samples present unique challenges in forensic DNA analysis due to their mineralised structure and the degradation of DNA over time. The dense, hard matrix of bones complicates extraction, often resulting in lower DNA yields and the presence of inhibitors that can affect analysis. Additionally, the exposure of bones to environmental conditions can fragment DNA, further complicating the process. Proper preparation and advanced extraction techniques are essential to overcome these difficulties and obtain reliable forensic results. This study evaluates the impact of incubation times (2 hours and 16 hours) on the quality of DNA profiles using the large-volume (heated) protocol with the EZ2® Connect Fx instrument. Bone samples were processed with the EZ1&2™ DNA Investigator® Kit, and DNA profiles were assessed for both incubation periods. Results showed that a 2-hour incubation had achieved high-quality DNA profiles comparable to those obtained with a 16-hour incubation. The shorter incubation significantly reduced processing time while maintaining high efficiency, thus improving overall operational efficiency. The 2-hour incubation protocol with the EZ1&2™ DNA Investigator® Kit provided a faster, efficient method for DNA extraction from bone samples, enhancing forensic analysis without compromising profile quality.

THE EFFECTS OF SOIL MICROBIAL DEGRADATION TOWARDS THE VOLATILE ORGANIC PROFILE OF NEAT GASOLINE IN TROPICAL COUNTRY

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Abstract: During arson investigations, detecting ignitable liquids like gasoline is crucial for confirming foul play. Gasoline, often used due to its affordability and ease of ignition, presents challenges when interacting with soil, as microbial degradation can complicate forensic analysis. This study examines how microbial degradation affects the volatile organic profile of gasoline in tropical soils. Experiments were conducted indoors and outdoors, using topsoil, peat, and palm oil soil. Samples were analysed on days 0, 7, 14, and 21. Chi-square test results showed that microbial activity significantly altered the volatile organic profile of gasoline, with notable differences between indoor and outdoor conditions. Palm oil soil had the highest microbial DNA concentration, while topsoil had the lowest, likely due to its dry texture, which could have limited the microbial growth and gasoline retention. The study found that only a few chemicals from neat gasoline were detectable after microbial degradation, and their presence varied depending on environmental conditions. These findings highlighted the importance of prompt sample collection in cases where microbial degradation will likely affect the evidence, ensuring that crucial arson indicators are preserved.

IDENTIFICATION OF MATERIALS IN BREAST FILLER BY HANDHELD FOURIER TRANSFORM INFRARED SPECTROMETER

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Abstract: A case report is presented on breast fluid aspirate specimen of a woman who underwent breast augmentation by illegal injection of liquid silicone. Silicone is a synthetic polymer made up of silicon, oxygen, carbon, and hydrogen, characterised by its flexibility, durability, and resistance to heat and moisture. It is commonly used in various applications, including medical devices, sealants, lubricants, and personal care products, due to its biocompatibility and inert nature. Polydimethylsiloxane (PDMS) is the basis for both breast implant silicone gel and the silicone rubber sac or shell which contains the gel. PDMS can be compounded with other materials such as filler to change the properties of the final product. One example of a PDMS compound is simethicone, a blend of PDMS and silicone dioxide (SiO_2). Based on the case information received, the patient experienced symptoms such as breast swelling, pain and redness. Attenuated total reflection-Fourier transform infrared (ATR-FTIR) spectra was acquired between spectral range of 4,000 cm^{-1} and 650 cm^{-1} using a Thermo (TruDefender FX4580) instrument. The $–CH_3$ absorption could be observed at 2962 cm^{-1}, the C-Si absorption at 1258 cm^{-1} and the Si -O-Si stretching vibration were detected at the shoulder of 1013 cm^{-1} and 796 cm^{-1}. In addition to that, the vibration of SiO_2 could be seen at 1079 cm^{-1}. It could be concluded that the material of the breast fluid was simethicone which is the mixture of PDMS and SiO_2.

InstaDNA™ VS. Whatman® VS. NucleoCard: WHICH FTA CARD PERFORMS BEST?

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Abstract: FTA cards, which are embedded with chaotropic agents, effectively inhibit infectious agents and minimise biohazards, thereby enhancing safety for technical staff during sample processing. This study evaluates the performance of three different FTA card brands, consisting of InstaDNA™, Whatman® and NucleoCard, in generating complete DNA profiles. Initial comparisons between InstaDNA™ and Whatman® cards using common extraction protocol with the AmpFLSTR Identifiler Direct Kit revealed that Whatman® cards offered superior reliability and performance. A subsequent analysis of amplification directly between Whatman® and NucleoCard using Globalfiler Express Kit revealed that NucleoCard performed marginally better. However, when pre-treatment (washing of the FTA card) was applied before amplification, both NucleoCard and Whatman® cards performed equally well. Pre-treatment methods like washing can play a crucial role in standardising results across different brands, making them a valuable consideration in the DNA profiling process. These results emphasise the significance of both performance and cost considerations in selecting the finest FTA card for DNA profiling.

RESEARCH TRENDS OF MONITORING DOMESTIC WASTEWATER ON INVESTIGATIVE STUDIES FOR ILLICIT DRUGS MANUFACTURING: A BIBLIOMETRIC ANALYSIS

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Abstract: This study analysis aims to explore the research landscape, trends, and key contributors in the domain of wastewater-based epidemiology in investigative studies on monitoring the activity of illicit drug manufacturing through bibliometric techniques. Recently, wastewater monitoring has emerged as a critical approach for detecting pollutants, tracking disease outbreaks, and assessing the effectiveness of treatment processes. This is the first study reveals the bibliometric analysis on the utilisation of wastewater as a tool in investigative studies in monitoring clandestine laboratories. The presence of illegal drugs in residential wastewater can indicate whether they are being consumed by the public or are being directly discharged into the sewer system. The bibliometric analysis employs Scopus databases and the latest VOSviewer software to evaluate publication patterns, citation metrics, and collaborative networks worldwide to provide a comprehensive overview of the field's growth and evolution based on follow: (1) Bibliometric statistical analysis was made on the literatures related to illicit drugs wastewater from 2010 to 2023 (2) The distribution of the number of articles published by countries/regions around the world, the cooperative relationship between countries/regions, and the highly cited articles are analysed; (3) Various methods are used to analyse the author's keywords, including keywords co-occurrence analysis; (4) According to the results of bibliometric analysis, we put forward the opinions on the research trends and hotspots in the

field of illicit wastewater in investigative studies. A steady increase in research output, reflecting the growing recognition of wastewater monitoring's importance in addressing investigative studies. The study identifies leading country, researchers, influential publications, and significant research themes, such as the detection of precursors, amphetamine and byproducts, and the use of wastewater-based epidemiology. This bibliometric study serves as a valuable resource for researchers, policymakers, and practitioners, offering insights into the current state and future directions of wastewater monitoring for investigative purposes.

DIFFERENTIATING GENDER IN DIGITAL LIP PRINT ANALYSIS: A STUDY OF UKM POPULATION ACROSS TIMELINE

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Abstract: Personal identification continues to become a big dilemma in forensic science. Cheiloscopy, known as lip print analysis, is a biometric technique gaining traction for personal identification. Similar to fingerprints, lip prints are unique patterns of ridges and furrows on the vermilion border of human lips. This study aims to investigate the feasibility of using digital lip print analysis to differentiate gender. Additionally, potential variations in lip print patterns based on timeline and based on day and night differences were explored. Three hundred sixty participants (180 males, 180 females) from the Universiti Kebangsaan Malaysia campus were randomly selected for this study. The lip print samples are collected on a standardised paper technique involving lip print impressions on a A4 paper. Digital analysis method was utilised where the samples were digitised using a high-resolution (300 dpi) scanner with a generated custom Phyton script to process the samples for pattern recognition, pattern similarity and gender classification. By investigating the potential of lip print classification with this method, this study could contribute to the growing research on digital lip print analysis, thus shedding light on the influence of lip print patterns as an alternative biometric tool.

RECOVERY OF BLOODSTAIN DNA EVIDENCE VIA EZ2 CONNECT - AN AUTOMATED DNA EXTRACTION

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Abstract: Bloodstains on fabrics are one of the common pieces of biological evidence encountered in forensic laboratories. This study was conducted to identify the recovery of DNA with the effect of storage condition and days of exposure by using the automated DNA extraction method using EZ2 Connect Fx Instrument. The cotton fabrics were stained with human blood, and exposed to three different conditions, including freezer, indoor and outdoor for 28 days. Samples were collected every 7 days. The concentration of DNA was measured by Quantifier Trio DNA Quatification Kit (Thermal Fisher Scientific). The results showed that, DNA quantity that was investigated in both freezer and indoor conditions with the temperature of -20°C and (22-26°C) respectively had remained the same during the whole period of the study, compared to outdoor condition with a temperature of (30-31°C). However, the concentration of DNA retained in freezer was found higher compared to the samples that were placed in indoor and outdoor conditions. The increase of DNA degradation was probably affected by three conditions: temperature, humidity and UV radiation. Furthermore, the use of EZ2 Connect yielded results within a shorter timeframe, reduce pipette and tip usage, almost completely minimising the risk of human error, exogenous DNA contamination and cross-contamination.

THE EFFECT OF VARIATION IN STORAGE CONDITIONS ON THE STABILITY OF KETUM ALKALOIDS FOR FORENSIC INVESTIGATION

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Abstract: In a forensic investigation, ketum is identified by detecting its alkaloid mitragynine. However, other alkaloids can also be found in ketum leaves for the identification of ketum. This study successfully detects mitragynine, paynantheine, and speciogynine in green vein and red vein ketum leaves collected in various regions of Pahang state. The alkaloids were extracted by sonicating the crushed ketum leave in chloroform: methanol solvent and detected using gas chromatography-mass spectrometry (GC-MS). From the data analysed, the average percentage of alkaloids composition for both alkaloids was 78% of mitragynine, 11% of paynantheine, and 10% of speciogynine with no significant differences between green and red ketum leaves. It was important to preserve the samples as the time between collecting, packaging, and analysis could be prolonged. One key to preserving forensic evidence for long-term storage before analysis is finding the optimal storage condition, which must not allow any change in the evidence. However, the effect of different storage conditions on the stability of these alkaloids has not been thoroughly described in previous studies. In this study, the stability of these alkaloids in three different storage conditions that are condition 1; the leaves were air dry, packaged in a paper bag and stored at room temperature, condition 2; kept in a security plastic bag, stored at room temperature, and condition 3; kept in a security plastic bag and stored at the refrigerator. The physical changes and alkaloids' stability were monitored every 7 days for 28 days. Different storage conditions resulted in the colour variation of the leaves from green to brown and turned to black and the degradation of selected alkaloids over time. This study provided a guideline on the optimal storage conditions for long-term storage by drying the ketum leaf sample using the air-drying method before packaging to maintain the quality of the ketum sample and preserve the alkaloids for ketum identification in forensic investigation.

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