NATIONAL FORENSIC SCIENCE SYMPOSIUM (NFSS) 2019

"ADVANCING FORENSIC SCIENCES"

25 JULY 2019
PULLMAN HOTEL, BANGSAR
KUALA LUMPUR

PROGRAMME BOOK

TABLE OF CONTENTS

Abstract for Poster Presentation — 33

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) 2019 hosted by the Forensic Science Society of Malaysia (FSSM).

We are delighted to host this event again, as a greater spark to gather professionals, researchers and academicians from the forensic science community for a mutual exchange of insights, views and experiences on current and future developments for the advancement of forensic science service and education.

NFSS 2019 with the theme "Advancing Forensic Sciences" includes workshops and presentations from invited speakers, oral presenters, and poster presentation participants coming from various parts of the country. I believe the well organised symposium programme will be memorable for you, besides serving as a part of continuous professional education and development for all of us.

We are indeed grateful to our strategic partners, Waters and Qiagen, who have generously sponsored this event. My sincere appreciation also goes to the Directory-General of KIMIA Malaysia for his strong support. I truly appreciate the participants from various governmental agencies, private institutions, and the universities who have been supporting us in various symposiums and seminars since the establishment of FSSM. I am thankful to the organising committee members for their hard work to make this symposium a successfully one.

Have a wonderful time at the symposium.

Thank you.

DCP (R) Dato' Dr. Yew Chong Hooi
Chairman
Organising Committee NFSS 2019

ORGANISING COMMITTEE

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                                 DSP Saravanan Kanniappan

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PROGRAMME

0830-0900	Registration		
0900-0910	**Welcoming Speech** DCP (R) Dato' Dr Yew Chong Hooi President of Forensic Science Society of Malaysia		
0910-0930	**Opening Speech and Opening Ceremony** Datuk Seri Dr. Mohd Azhar Bin Hj. Yahaya Secretary General Ministry of Energy, Science, Technology, Environment & Climate Change (MESTECC)		
0930-1015	**PLENARY SESSION I:** **Quality Assurance in Forensic Science** Halimah Abdul Rahim Department of Chemistry Malaysia		
1015-1045	**Morning Tea Break**		
Scientific Sessions			
	Ballroom 2	**Studio 1**	**Studio 3**
1045-1100			**Household Items Interferences in Ignitable Liquid Residue: Forensic Fire Debris Analysis in Malaysia** Mohd Amir Husna B. Nik Alli @ Zulkifli Department of Chemistry Malaysia
1100-1115			**Differences in the Volatile Chemical Fingerprint of Petrol Burnt at Different Durations; RON 95, from Different Oil Providers in Malaysia** Dheephikha Kumaraguru Universiti Kebangsaan Malaysia
1115-1130	**Workshop I** **Forensic Toxicology-Advancing Analytical Strategies from Screening to Confirmation** Davina Law Stewart Waters Corporation	**Workshop II** **Your Partner in Forensic** Melvyn Ong QIAGEN Biotechnology Malaysia Sdn Bhd	**Introduction to the Asian Forensic Sciences Network (AFSN) Trace Evidence Working Group (TEWG) Explosive Database** Sivabalan Nagayah Department of Chemistry Malaysia
1130-1145			**Regression Analysis to Determine Stature from Handprint Anthropometry among Ilocano Population in Philippines** T. Nataraja Moorthy Management and Science University
1145-1200			**The Use of Mandibular and Maxillary Canine Teeth in Establishing Sexual Dimorphism in the Malaysian Population of Selangor** Yuvenya Kaeswaren Management and Science University
1200-1215			**Document Examination Case Study: Determining Sequence of Entries between Handwritten Signature and Printed Details on Questioned Documents** Nurul Atiqah Binti Mohd Noh Department of Chemistry Malaysia

1215-1230	Analysis of Protein Adducts as Biomarkers of Exposure to Organophosphate Nerve Agents Wan Noor Mahirah Department of Chemistry Malaysia	**Workshop II** **Your Partner in Forensic** Melvyn Ong QIAGEN Biotechnology Malaysia Sdn Bhd	Classification of Individuals according to Ethic Groups in Malaysia using Numeral Characters: A P reliminary Study Tay Eue Kam Universiti Sains Malaysia
1230-1430	**Lunch**		
	Scientific Sessions		
	Ballroom 2	**Studio 1**	**Studio 3**
1430-1445	**Determination of Colourless Crystalline Methamphetamine Detection Limit using Raman Spectroscopy** Muhammad Abdul Faiz Zainuddin Department of Chemistry Malaysia	**Population Data of 21 Autosomal Short Tandem Repeats Loci in Malaysian Populations** Mohd Nor Azlan Ab Rashid Royal Malaysia Police	**Forensic Discrimination of Malaysian Chinese and Malays Based on Morphometric Measurement of Scalp Hair** Lee Loong Chuen Universiti Kebangsaan Malaysia
1445-1500	**Application of Isotopes Ratio Mass Spectrometry (IRMS) Technique in Drug Analysis** Nur Hidayah Binti Samsudin Department of Chemistry Malaysia	**Validation and Verification of DNA Extraction from Fingernails using Prepfiler® BTA Forensic DNA Extraction Kit on Automate Express™** Erizasyira Basri Department of Chemistry Malaysia	**The Biodiversity and Abundance of Forensically Important Mites at Four Different Localities in Malaysia** Nurul Azmiera Universiti Teknologi MARA
1500-1515	**Measuring PMI via Molecular Dynamics using FFC-MRI and FFC-NMR** Saravanan Kanniappan Royal Malaysia Police	**Next Generation Sequencing of Mitochondrial Genome for Six Autochthonous Orang Asli Subgroups in Peninsular Malaysia** Sharifah Nany Rahayu Karmilla Syed Hassan Universiti Sains Malaysia	**Study the Pattern of Cell Phone Usage Associated with Side Effects among University Students: Case Study in a Malaysian University** Sohayla Mohamed Elsherbini Attalla Management and Science University
1515-1545	**Afternoon Tea Break**		
1545-1630	**PLENARY SESSION II:** **Malaysia Experience in Establishing DNA Database** ACP Tang Ngat Ngoh Royal Malaysia Police		
1630-1700	**Closing**		

ABSTRACT FOR PLENARY SESSION

QUALITY ASSURANCE IN FORENSIC SCIENCE

Halimah Abdul Rahim

Department of Chemistry Malaysia

Abstract: Forensic science laboratories have a certain obligation in regard to quality. Forensic examination results play a significant role in bringing various criminal investigations to a successful conclusion. The quality of the results of examinations performed in the laboratories has always been the concern of the individual forensic scientist and have far-reaching consequences – life or death in some jurisdictions. In order for Forensic Science to be fully relied on within a case, the Quality of the Laboratory where the evidence is examined should be an appropriate operating working standard (Quality assurance). This is best realised through a stringent quality assurance and quality control program in laboratories. Many factors are important contributors to quality assurance in Forensic Science laboratories such as evidence collection, handling, transportation, examination techniques, laboratory analysis, report writing and court testimony.

MALAYSIA EXPERIENCE IN ESTABLISHING DNA DATABASE

ACP Tang Ngat Ngoh

Royal Malaysia Police

Abstract: The Forensic DNA Databank Malaysia (FDDM) was established after the Deoxyribonucleic Acid (DNA) Identification Act 2009 (Act 699) was enforced in 2012. The FDDM consists of seven indices – Crime Scene, Suspected Persons, Convicted Offenders, Detainee, Drug Dependents, Missing Persons and Voluntary. For collection of DNA samples, the Police had set up One-Stop Forensic Identification Centre at all district Police Headquarters nationwide.

This DNA Database is link up with the Department of Chemistry Malaysia (KIMIA) in which the Royal Malaysia Police DNA Laboratory handles databank samples whereas KIMIA handles the evidence samples.

To-date, there are over 100,000 profiles in the DNA Database. There have been 51 "HITS" (profiles matching) for crime cases including house breaking, rape, robbery, murder and identification of missing person. The FDDM as a crime solving tool has aided in the arrest of perpetuators, prosecute in courts and put them behind bars.

ABSTRACT FOR WORKSHOP

FORENSIC TOXICOLOGY — ADVANCING ANALYTICAL STRATEGIES FROM SCREENING TO CONFIRMATION

Davina Law Stewart

Waters Corporation

Abstract: Monitoring of seized material and biological specimens plays a key role in the enforcement of drug control programs. Drug analysis particularly in biological matrices is becoming increasingly challenging for the routine forensic testing laboratory. Samples may include common controlled and illicit drugs, benzodiazepines, prescribed and illicit opioids, synthetic fentanyls, synthetic cannabinoids, and other stimulants. In this presentation, we would explore advanced analytical strategies that would enable direct analysis for "on the spot" mobile testing, broad screening techniques that can be used to detect toxicants in highly complex biological matrices such as ante/ post-mortem specimens and a powerful discovery tool for the analysis of new psychoactive substances. We will also discuss about the pathway to creation of defensible data which ensures data security and traceability.

ABSTRACT FOR ORAL PRESENTATION

ANALYSIS OF PROTEIN ADDUCTS AS BIOMARKERS OF EXPOSURE TO ORGANOPHOSPHATE NERVE AGENTS

Wan Noor Mahirah

Department of Chemistry Malaysia

Abstract: Organophosphate nerve agents (OPNA) are types of chemical warfare agents (CWA) and are prohibited under the Chemical Weapons Convention. The convention serves to outlaw the development, production, stockpiling and use of CWA. Misused of CWA during an attack involving chemicals is confirmed via analysis of environmental samples to confirm the presence of CWA and their degradation products. These samples may include but not limited to water, air or soil samples. However, in order to assess if a potential victim was exposed to OPNA, the analysis of biomedical samples such as blood and urine is required. Following entry into the human body, OPNA are hydrolysed, metabolised, or form adducts with endogenous macromolecules such as proteins and DNA. The free OPNA and their urinary metabolites have relatively short lifetimes in the body. On the contrary, adducts with biomolecules are stable and more persistent thus become an important biomarker as definite proof of exposure to OPNA. This presentation provides an overview of protein adducts as biomarkers of exposure to OPNA. The main focus will be on the analytical techniques to analyze OPNA-Butyrylcholinesterase adduct, as well as OPNA-Tyrosine adduct cleaved from plasma albumin.

DETERMINATION OF COLOURLESS CRYSTALLINE METHAMPHETAMINE DETECTION LIMIT BY USING RAMAN SPECTROSCOPY

Abdul Faiz[1], Faznur Azilah[1], Vasagee Elencovan[2], Ahmad Nazri[1], Gunalan Varatharajan[1], Nurfatin Kamaruzaman[1], Mukhtar[1]

[1]*Jabatan Kimia Malaysia Negeri Perak, Jalan Sultan Azlan Shah, 31400 Ipoh, Perak Darul Ridzuan*

[2]*Forensic Science Programme, Faculty of Health Science, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor*

Abstract: Raman spectroscopy, based on inelastic light scattering is a novel analytical technique for detection and identification of drug of abuse in seized samples. Since it plays a significant role in forensic analysis of illicit drug, it is important to assess and verify its operational performance and reliability under defined conditions. Therefore, the aim of this research was to determine the limit of detection for methamphetamine using Raman instrument. Colourless crystalline methamphetamine was chosen as the drug of interest in this study as it is one of the most abused drugs in Malaysia. During analysis, sugar was used as a diluent to cut the drug since it would not change the physical appearance of methamphetamine. After conducting a brief pilot study, the colourless crystalline methamphetamine was serially diluted with sugar to achieve twelve purity levels ranging from 5 – 20%. Each sample was scanned in 10 replicates (n=10) using the Raman device. The findings suggested that the ability of the Raman instrument to detect methamphetamine depending on the sample purity. The probability of methamphetamine detection increased progressively with its intensifying concentration within a sample. It was proven that colourless crystalline methamphetamine was detectable at a minimum purity level of 19% methamphetamine. Besides, this study proposed a few factors that could affect the detection of minute quantities of the target drug such as matrix interferences, sample homogeneity and fluorescence property.

APPLICATION OF ISOTOPE RATIO MASS SPECTROMETRY (IRMS) TECHNIQUE IN DRUG ANALYSIS

Nur Hidayah Samsudin, Vanitha Kunalan, Yusoff Mengu

Narcotics Division, Forensic Science Analysis Center, Department of Chemistry Malaysia, Petaling Jaya

Abstract: Isotope Ratio Mass Spectrometry (IRMS) provides analysis of isotopic ratios of the light stable isotopes such as Carbon (C), Nitrogen (N), Oxygen (O), Sulfur (S) and Hydrogen (H). IRMS is an instrument that are specifically designed to measure precisely small differences in the abundances of isotopes. Isotopic variations are found in variety of materials while isotopic profile is unique to the origin and history of the substances. Therefore, IRMS has a wide range of applications for instance in forensic sciences, archaeology and biological sciences. For forensic sciences, IRMS can be used to determine whether samples can be link by geographic origin for samples from different sources. A more detailed analysis of drug samples by profiling can be used to provide 'collective' information for law enforcement. This research involved profiling of seized methamphetamine hydrochloride samples by using IRMS. Quantitative measurement of the $\delta 13C$, $\delta 15N$, and $\delta 2H$ values in each sample revealed that the stable isotope ratios for a particular methamphetamine vary from one seizure to another. The IRMS method was able to discriminate methamphetamine by synthetic routes or precursors.

MEASURING PMI VIA MOLECULAR DYNAMICS USING FFC-MRI AND FFC-NMR

Saravanan Kanniappan

Royal Malaysia Police

Abstract: Post-mortem interval (PMI) refers to time elapsed since an individual was dead. Whenever the time in question is not known, scientific techniques could be used for determination of PMI. This presentation demonstrates the use of FFC-MRI and FFC-NMR in aiding forensic investigation of this purpose.

POPULATION DATA OF 21 AUTOSOMAL SHORT TANDEM REPEATS LOCI IN MALAYSIAN POPULATIONS

Mohd Nor Azlan Ab Rashid[1,2], Naji Arafat Mahat[1], Hussein Omar Khan[2], Siti Afifah Ismail[2], Roswanira Abdul Wahab[1], Hasmerya Maarof[1], Sharifah Nany Rahayu Karmilla Syed Hassan[3]

[1]*Department of Chemistry, Faculty of Science, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia*

[2]*DNA Databank Division (D13), Criminal Investigation Department, Forensic Laboratory of Royal Malaysia Police, BT. 8 ½ , Jalan Cheras, 43200 Cheras, Selangor*

[3]*Human Identification/DNA Unit, School of Health Sciences, Universiti Sains Malaysia, Health Campus, 16150 Kubang Kerian, Kelantan, Malaysia*

Abstract: The use of 21 autosomal STRs loci for human identification has been gaining popularity throughout the world. Hitherto, data for the diverse Malaysian populations remain unreported. Using the GlobalFiler^{TM} Express PCR Amplification kit, complete DNA profiles of 21 STRs loci from buccal swabs of convicted Malaysian criminal (n = 570; 190 each for Malays, Chinese and Indians) (in the year 2016 to 2017) were analysed for their allele frequencies, exact test of Hardy-Weinberg equilibrium, observed and expected heterozygosity, power of discrimination, power of exclusion, match probability and polymorphism information content. Being the most informative locus, SE33 demonstrated the highest power of discrimination and power of exclusion, indicating it usefulness to discriminate individuals. In contrast, TPOX had the lowest power of discrimination and power of exclusion, as well as being the less informative genetic locus for all Malaysian populations studied here. The probabilities that two individuals would share the same DNA profiles among the Malaysian Malays, Chinese and Indians, as well as in general Malaysian population were 1.3713×10^{-25}, 2.8822×10^{-25}, 7.5668×10^{-26} and 1.0385×10^{-26}, respectively. The results obtained here were found comparable with similar studies reported in other populations. Hence, its robustness for forensic human identification among the Malaysian populations is therefore, statistically supported.

VALIDATION AND VERIFICATION OF DNA EXTRACTION FROM FINGERNAILS USING PREPFILER® BTA FORENSIC DNA EXTRACTION KIT ON AUTOMATE EXPRESS™

Erizasyira Basri

Department of Chemistry Malaysia, 46661 Petaling Jaya, Selangor, Malaysia

Abstract: DNA profiling of human remains for identification either from forensic cases or mass disaster can be a challenging task. Prolonged exposure to environmental factors such as humidity and heat also geographical location can highly influence the quality of DNA and result in the impediment of a DNA profile. In such situation, hard tissues such as bone and teeth will be the samples of choice for extracting the DNA. However, the process involved will be invasive, laborious and time consuming; requires powdering and decalcification in bone extraction and fragmentation step for teeth makes it not suitable for urgent body identification. With respect to that, the use of nail material as a DNA source in genetic identification will be more preferable since it can produce a reliable DNA profile and the extraction process is rapid and less laborious compared to bone and teeth samples. This validation and verification study has shown that the used of fingernails as a source for DNA typing using PrepFiler® BTA Forensic DNA Extraction Kit on Automate Express™ has expedited the process in body identification cases.

NEXT GENERATION SEQUENCING OF MITOCHONDRIAL GENOME FOR SIX AUTOCHTHONOUS ORANG ASLI SUBGROUPS IN PENINSULAR MALAYSIA

Syed Hassan Sharifah Nany Rahayu Karmilla[1], Abd Rashid Nur Haslindawaty[1], Sundararajulu Panneerchelvam[1], Mohd Nor Norazmi[1], Zainuddin Zafarina[1,2]

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[2]*Analytical Biochemistry Research Centre (ABrC), Universiti Sains Malaysia, 11800 USM Penang, Malaysia*

Abstract: Orang Asli (OA), the indigenous population, is the national heritage of Peninsular Malaysia. Most of them continue to have very slow population growth for the past 20 years, leading to low genetic diversity. Here, we analyzed full mitochondrial DNA sequence (mtGenome) of six OA subgroups – Semang (Kensiu, Lanoh, Bateq), Senoi (Semai, Che Wong) and Proto Malay (Orang Kanaq). This study investigates the OA individual's the mitochondrial genome sequence using Next Generation Sequencing (NGS) technology, which were ion semiconductor (Ion Torrent) and reversible terminator chemistry (Illumina) platform and then confirming detected heteroplasmy by Sanger sequencing (Genetic Analyzer). Homopolymeric C tract were traced in hypervariable I (HVI). A total of 14 Orang Asli individuals were found to have the homopolymeric C tract in HVI. The longest cytocine tract (14 bases) was observed in Bateq individuals due to nucleotide transversion from A to C at nucleotide position (np) 16182. Each variant identified was manually validated by visualizing BAM files using Integrative Genomics Viewer (IGV) software and subsequently confirmed by Sanger sequencing viewed in Chromas software. NGS platform was more sensitive to detect heteroplasmy compared to Sanger Sequencing since NGS allows deep coverage of the genome through multiple independent sequence reads. However, low level heteroplasmy sites may be led by the interference of nuclear sequences of mitochondrial origin

(NUMTs) on the detection of rare variants. Private mutations were considered using an online pipeline, HaploGrep2, and subsequently haplogroups of the OA individuals were determined. The mtGenome analysis identified 113 haplotypes for the Orang Asli with 110 exclusively unique haplotypes. The OA individuals were extensively diverse as they exhibited very high gene diversity (GD = 0.9982 ± 0.0016). The OA subgroups were facing a very high degree of evolutionary pressure as Orang Kanaq, Kensiu and Semai showing complete isolation (F_{STi} = 1.00000). The fixation index (F_{ST}) for the entire Orang Asli subgroups was estimated as 0.27640 showing the OA as a single entity.

HOUSEHOLD ITEMS INTERFERENCES IN IGNITABLE LIQUID RESIDUE: FORENSIC FIRE DEBRIS ANALYSIS IN MALAYSIA

Mohd Amir Husna B. Nik Alli @ Zulkifli

Department of Chemistry Malaysia, 46661 Petaling Jaya, Selangor, Malaysia

Abstract: Fire investigation involved scene investigation followed by laboratory analysis to identify any ignitable liquid in the fire debris sample. In an arson case, the perpetrator usually will use an accelerant to start and accelerate the fire. Liquid accelerant such as petrol, kerosene and diesel is the most popular because it is readily available, inexpensive and very effective. During laboratory analysis using GC-MS, the presence of ignitable liquid residue in fire debris sample is confirmed by using pattern comparison and determination of individual components by comparing with the GC-MS library. Fire debris samples that have been sent to laboratory vary in their types of material. The material contains a substrate that contains varieties of volatiles element that can mistakenly interpret as a part of ignitable liquid residue and subsequently will contribute to false positive lab result. The purpose of this study is to conclude the extent of interference from burnt and unburnt household items hydrocarbon compound in fire debris analysis. Twenty typical Malaysian household items have been analysed and compare to the three types of standard ignitable liquid, namely petrol, kerosene and diesel. From the research, it was found that several household items can produce some hydrocarbon peaks in heavy petroleum distillates category, that is also contained in kerosene and diesel. Some samples also produced a pattern almost similar to the kerosene chromatograms pattern. Petrol does not significantly turn up as any of component in any household items. The results show the need and importance of control sample, background information and analyst's experience in making sure the right fire investigation findings.

DIFFERENCES IN THE VOLATILE CHEMICAL FINGERPRINT OF PETROL BURNT AT DIFFERENT DURATIONS; RON 95, FROM DIFFERENT OIL PROVIDERS IN MALAYSIA

Dheephikha Kumaraguru,Khairul Osman & Gina Francesca Gabriel

Forensic Science Programme, Faculty of Health Sciences, Universiti Kebangsaan Malaysia, Jalan Raja Muda Abdul Aziz, 50300 Kuala Lumpur, Malaysia

Abstract: Petrol is often used as a fire accelerant as it is an effective, cheap and readily available commercial ignitable liquid. The determination of its residues in arson cases is gravely useful for fire investigations. It is known that different burning durations of petrol causes it to lose different compounds at various rates. Another known fact is that different oil providers use different addictives to enhance their product quality. This study aims to determine the differences in the volatile chemical fingerprint of petrol burnt at different durations (30 s, 60 s, 90 s, 120 s) from three different oil providers (X, Y, Z) in Malaysia. Petrol samples were prepared by burning 30 mL petrol in aluminum can for different durations. Volatiles were adsorbed onto activated carbon tablets (ACT) and incubated for 16 hours at 80ºC before extraction with 2 mL pentane and injected into the GC-MS. Results showed that more alkyl benzenes were detected in the 30 s-burnt petrol compared to the other durations. While majority of the volatile chemical fingerprints were similar across the three oil providers, however differences were noted in groups of compounds from each of the oil providers namely 2-hexene, 3,7-dimethyl-1-octene, 2,2,4-trimethylpentane and so on. By identifying variations in the group of volatile compounds from different burning duration and oil providers, discrimination as to the length of burning and the source of petrol could be executed accurately.

INTRODUCTION TO THE ASIAN FORENSIC SCIENCES NETWORK (AFSN) TRACE EVIDENCE WORKING GROUP (TEWG) EXPLOSIVE DATABASE

Sivabalan Nagayah

Department of Chemistry Malaysia, 46661 Petaling Jaya, Selangor, Malaysia

Abstract: Bombing incidents are a very real threat in Asia. The recent Easter Day bombings in Sri Lanka is a grim reminder that we can never be complacent in dealing with these threats. This is the reason the TEWG under the banner of AFSN came up with the idea of establishing an explosive database comprising real case work data from its member countries. Started in 2015, the TEWG conducts annual technical meetings where forensic practitioners from member countries present and share the explosive cases encountered in their countries. The data shared by the members are compiled in a database that is accessible online to all the members involved in the meeting. Among the contents of the database are the raw materials used in bomb making, explosive residue analysis results, technical parameters for analysis and the trend of explosive cases in member countries. The database also serves as a multinational reference as it is common for some bombs/bomb makers to cross national borders especially in the South East Asian region. The work by the ASFN TEWG is a continuous effort from dedicated forensic practitioners to ensure that bombing incidents can be prevented by using the data in the database for intelligence purposes.

REGRESSION ANALYSIS TO DETERMINE STATURE FROM HANDPRINT ANTHROPOMETRY AMONG ILOCANO POPULATION IN THE PHILIPPINES

T. Nataraja Moorthy & Ivan Nikkimor LD

Faculty of Health and Life Sciences, Management and Science University, Shah Alam, Selangor, Malaysia

Abstract: In any forensic investigation, the primary aim is to identify the individual, either as victim or perpetrator. The crime scene investigators are searching for physical evidence in the place of occurrence for person identification. The formulation of a biological profile such as stature and gender is a key element in forensic investigation. Handprint and fingerprint anthropometry may help in narrowing down the possible matching identities. Literature review shows that a limited number of studies have been conducted on stature estimation from handprint measurements in the Philippines. The present study was aimed to derive population specific regression equations to determine stature from handprint anthropometry of Ilocano ethnic group living in the Philippines, since it is improper to utilize a single equation derived from a particular population for various populations. The study samples consist of 120 (60 males and 60 females) adults consented Ilocano, based on the sample size calculation and collected handprint and stature measurements following the standard procedure. the data were analysed statistically and derived regressions to determine stature from handprint anthropometry among Ilocano for forensic application.

THE USE OF MANDIBULAR AND MAXILLARY CANINE TEETH IN ESTABLISHING SEXUAL DIMORPHISM IN THE MALAYSIAN POPULATION OF SELANGOR

Yuvenya Kaeswaren & Anita Zara Weinheimer

Faculty of Health and Life Sciences, Management and Science University, Shah Alam, Selangor, Malaysia

Abstract:

Sex determination is one of the major roles of forensics in establishing an individual's identity. Teeth are excellent tools in living and non-living victim identification in the field of forensic investigations. Amongst all teeth, the mandibular and maxillary canine teeth are found to exhibit greatest sexual dimorphism. This study was conducted to investigate the effectiveness of using mandibular and maxillary canine width as well as intercanine distance in establishing sexual dimorphism in Malaysian population of Selangor. The sample comprised of 140 Malaysian individuals residing in Selangor, ages ranged between 18-30 years at a gender ratio of 1:1. The greatest mesiodistal width of the canine teeth and the intercanine distance were measured using digital vernier caliper with 0.01mm resolution. The values obtained were subjected to analysis and statistically significant sexual dimorphism was shown by the mandibular and maxillary canines. The mean values for left and right mandibular and maxillary canine widths were less for females than for males and the differences were statistically significant ($P<0.01$). The mean value for mandibular and maxillary intercanine distances for females were less than for males and the differences were statistically significant ($P<0.01$). Gender predictability using the standard canine index (SCI) and mandibular canine index (MnCI) showed acceptable results whereas the maxillary canine index (MxCI) showed poor gender predictability. Thus, the use of statistically significant sexual dimorphism in mandibular and maxillary canines in sex determination was conclusively established .

DOCUMENT EXAMINATION CASE STUDY: DETERMINING SEQUENCE OF ENTRIES BETWEEN HANDWRITTEN SIGNATURE AND PRINTED DETAILS ON QUESTIONED DOCUMENTS

Nurul Atiqah Mohd Noh, Teo Chee Hau, Siti Nur Musliha Mohamad Noor

Forensic Science Analysis Centre, Department of Chemistry Malaysia, 46661 Petaling Jaya, Selangor, Malaysia

Abstract: In production of official document, different types of printing process and handwritten entries were often added onto the same document subsequently by the respective personnel or authorities. However, the sequence of document's production usually remains untraceable and arguable. Therefore, document examiner is often required to ascertain the sequence of entries between different types of printing process and inks on the disputed document. Document Examination Division, Forensic Science Analysis Centre, Department of Chemistry Malaysia received a case requesting to ascertain the sequence of entries between the overlapped signatures and printed characters on documents. Document examiner had to determine either the questioned signatures were written after or prior the document being printed. Video Spectral Comparator 6000 attached with stereomicroscope was used to conduct the forensic examination of intersecting strokes of signatures and printed entries. In this case study, samples were prepared to simulate different sequences of entries during the production of document. Observation of the simulated samples was then compared with that of the questioned documents. The microscopic examination of the intersecting strokes showed that the pen ink was above the toner particles of electrophotographic printing process. Hence, it was concluded that both questioned signatures were written after the documents were printed.

CLASSIFICATION OF INDIVIDUALS ACCORDING TO ETHIC GROUPS IN MALAYSIA USING NUMERAL CHARACTERS: A PRELIMINARY STUDY

Tay Eue Kam, Wan Nur Syuhaila Mat Desa, Dzulkiflee Ismail

Forensic Science Programme, School of Health Sciences, Universiti Sains Malaysia, Health Campus, 16150 Kubang Kerian, Kelantan

Abstract: One of the most challenging aspects in performing handwriting examinations is the vast amount of features that need to be considered for analysis. Nonetheless handwritings have shown to have potential to classify individuals according to their nationalities, gender and handedness which tremendously benefit forensic investigation. As far as this study is concerned, there is yet a study conducted in Malaysia using handwritings let alone numeral characters intended for classification of individuals according to their ethnicity. Henceforth, this study is conducted in the quest to gauge whether or not individuals may be classified according to their ethnicity using the overwhelming features which could be extracted from numeral characters from 0 to 9. In this preliminary study, numeral characters samples were collected from individuals from three major ethnic groups in Malaysia namely Malay (n = 102), Chinese (n = 30) and Indian (n = 20) regardless of their educational backgrounds. The relative height to width ratio features which were manually measured from each of the numeral characters were subjected to statistical analyses of either Analysis of Variance (ANOVA) or Kruskal-Wallis. From the analyses, it was found that several numeral characters may be potentially used to classify individuals according to their ethnicity. Further studies are therefore recommended to be undertaken to explore other influences to the outcomes obtained from this study.

FORENSIC DISCRIMINATION OF MALAYSIAN CHINESE AND MALAYS BASED ON MORPHOMETRIC MEASUREMENT OF SCALP HAIR

Loong Chuen Lee, Wan Nur Syazwani Wan Mohamad Fuad, Sharifah Shakilah Abdullah & Raymond Kay Loke Ong

Forensic Science Program, Faculty of Health Sciences, Universiti Kebangsaan Malaysia

Abstract: Hair is one of the most frequently encountered physical evidence attributed to the strong disulphide bonding and the fact that hair fall is often unnoticeable. Hair can be assessed according to morphology (e.g. cross sectional shape) and morphometric measurements (e.g. medullary index). Hair analysis could be valuable if it provides information about sex or race of the donor. This preliminary work aims to differentiate the two different ethnicities in Malaysia based on morphometric measurements on scalp hairs. The hair width (HW), scale layer difference (SLD) and medullary index (MI) were measured from 1000 hair samples, i.e. 500 Chinese and 500 Malays. Based on the measurements, the differences in terms of gender and races were assessed using descriptive and inferential statistics. The three index exhibited statistically significant differences in terms of race. On the other hand, Chinese males and females could be discriminated in terms of MI; and Malay males and females can be different in terms of SLD. In addition, hairs originating from upper and lower head regions were found to be homogeneous for a particular donor. In conclusion, our study has demonstrated the feasibility to determine race based solely on morphometric measurements of scalp hair.

THE BIODIVERSITY AND ABUNDANCE OF FORENSICALLY IMPORTANT MITES AT FOUR DIFFERENT LOCALITIES IN MALAYSIA

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Abstract: Recent development in forensic acarology has raised the interest of researchers on the importance and use of Acari in death investigations. Understanding changes in ecoregions that affected the mites' diversity and abundance is important as they are useful as forensic indicators to detect location of death and determination of minimum post-mortem interval (mPMI). Therefore, the aim of this study was to determine the diversity and abundance of forensically important mites at four different ecoregions in Malaysia. Three rabbit carcasses were placed at each different locality namely forest, highland, village, and oil palm plantation. One hundred gram of soil samples were collected from beneath and around the decomposing carcasses every three days until the carcasses reached the skeletonization stage (i.e., 40 days). The soils were then placed in the Berlese-Tullgren funnel for extraction of mites prior to slide mounting for identification to the family level. The ambient temperature and the amount of precipitation for each location were recorded. The abundance of mites in the forest was significantly higher than the other study sites (P <0.05) with the mean abundance of 7.47, ±7.52. Mites recovered from highland (5.30, ±8.58) and oil palm plantation (4.23, ±5.49) were significantly higher than those from the village (1.92, ±3.52). The most abundant family of mites of forensic importance in the forest was Macrochelidae; Histiostomatidae, on the highland, and Acaridae for both village and oil palm plantation. The soils samples collected from beneath and around the carcasses contained significantly more mites than those in the control soil (P<0.05). The introduction of carrion to the soil ecosystem has caused significant changes in the abundance of mites and further study is therefore needed to validate these changes as geographical and mPMI indicators .

STUDY THE PATTERN OF CELL PHONE USAGE ASSOCIATED WITH SIDE EFFECTS AMONG UNIVERSITY STUDENTS: CASE STUDY IN A MALAYSIAN UNIVERSITY

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Abstract: Cell phone is a device that has been used almost every day for all age groups. It connects everyone and everything around the world as it provides various social platforms. However, not many people realized that cell phone is a source of non-ionizing electromagnetic waves that can be associated with various physical effects. Therefore, the aim of this research is to identify the physical side effects associated with exposure to the electromagnetic waves emitted by cell phone use and to detect if these effects are associated with specific pattern of use. A cross-sectional study was conducted on 166 research participants by simple random sampling from university students. Data were analyzed using SPSS version 23. The results showed that the study participants that having side effects were those that using cell phone since as early as 12 years old, for about 5 to 10 years, and been using it for more than 5 hours daily as a communication purposes. Mostly, those that using handheld cell phone has been complaining of one symptom or another associated with usage. 56.6% of students having dry mouth, 52.4% having ear pain, 46.4% having bad odor in the mouth, 57.8 having anxiety or insomnia and 79.5% having headache. There is a specific pattern associated with occurrence of side effects due to cell phone use .

ABSTRACT FOR POSTER PRESENTATION

DEGRADATION OF LATENT FINGERPRINTS ON PLASTIC SUBSTRATE SUBMERGED IN WATER

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Abstract: Fingerprint is valuable identification evidence because it provides link to potential suspect. Theoretically, fingerprint is made up of metabolism products of the donor which include waters, amino acids, fatty acids and some miscellaneous minerals. Degradation of the print starts once it is deposited on the surface, i.e. waters will be evaporated. The purpose of this preliminary work is to assess rate of degradation of fingerprint deposited on plastic 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). A highly degraded fingerprint would be characterized by high DMR value and *vice versa*. Results showed that the fingerprint achieved 100% degradation after 21 days of deposition. The relationship between DMR and days after deposition was modelled using linear regression equation. In conclusion, our study has demonstrated the alternative value of degraded fingerprints. Future study shall explore statistical and image analysis approaches in assessing the changes of fingerprint more precisely and focuses on other types of substrates.

GENDER DISCRIMINATION BASED ON NUMBER OF FINGERPRINT RIDGES IN MALAYSIAN INDIAN POPULATION

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Abstract: Fingerprint is one of the most important physical evidence due to its uniqueness. Suspect can be identified and determined by comparing the questioned fingerprint from the crime scene with fingerprint obtained from suspect. However, in real practice, suspect is seldom available at the initial stage of investigation. As such, some researchers have attempted to assess the number of ridges of fingerprint for sexual dimorphisms. In fact, sexual dimorphisms based on the number of fingerprint ridge has been reported elsewhere but limited number of works are devoted to Malaysian Indian population. The purpose of this preliminary work is to assess the feasibility to determine sex based on the number of fingerprint ridges. A total of 1000 fingerprints was collected from ten fingers of 100 Malaysian Indians, i.e. 50 males and 50 females. Number of ridges across the diagonal within a 25 mm^2 region on each of the 1000 samples was determined via hand-held digital microscope camera. Results show males have lower number of ridges than females in all the ten fingerprints. The differences were statistically significant at the 0.05 level, except for right thumb. In conclusion, the sex of Malaysian Indians could be determined based on the number of fingerprint ridges.

EFFECT OF SUNLIGHT TO METHAMPHETAMINE IN URINE

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Abstract: The forensic chemists are often challenged concerning the accuracy of the analytical result especially in cases where the specimen of the accused was kept in the enforcement officer's office or in a car exposed to sunlight during the transportation. The possibility of decomposition or degradation of a drug in the urine specimen by sunlight has become an issue. In this work, the stability of methamphetamine in urine was evaluated towards various exposure periods of sunlight. Urine specimens containing 1 to 5 ug/ml methamphetamine were chosen for this study. Each specimen was transferred into 20 microtubes, capped properly and placed under the sun on every sunny day. One microtube from each specimen was collected when the preset interval period of the sunlight exposure had been attained. The concentration of the analyte was determined by Enzyme Linked Immunosorbent Assay (ELISA). Results showed that the concentration of methamphetamine in all urine specimens decreased if the sunlight exposure time increased. Although the temperature of the urine increased during the sunlight exposure process, previous research suggested that there was no significant effect of temperature to the loss of methamphetamine in urine. In conclusion, sunlight could reduce the concentration and eliminate the methamphetamine in urine .

WEATHERING EFFECTS ON THE VOLATILE CHEMICAL FINGERPRINT OF RON95 PETROL AND KEROSENE IN MALAYSIA

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Abstract: The analysis of ignitable liquid residues (ILR) is carried out in order to investigate fire scenes suspected of arson. ILR at a fire scene is commonly subjected to degradation and decomposition (weathering) during and after a fire. The possibility of weathered ignitable liquid to have different volatile chemical fingerprint in comparison to its original profile, is high, hence, the determination of these differences is immensely useful in fire investigations. This research intends to analyse the volatile chemical fingerprint of weathered RON95 petrol and kerosene in Malaysia at different elevated temperatures and exposure durations in both outdoor and indoor conditions. Ignitable liquid was weathered to 25%, 50%, 75% and 90% by volume at temperatures 35°C-70°C. For exposure duration, ignitable liquid was exposed to air for 10 minutes-60 minutes with 10 minutes' intervals. 1 mL of each sample was then analysed with the Gas Chromatography-Mass Spectrometry (GCMS). Results showed that the loss of volatiles in the ignitable liquid that was exposed to higher temperature and longer exposure durations were more prominent compared to the ones exposed to lower temperature and shorter exposure durations. By identifying the variations in the presence and absence of specific group of volatile compounds of ILR under different weathered conditions, higher accuracy of proper identification can be executed during the laboratory analysis of fire debris samples.

SEXUAL DIMORPHISM IN THE CERVICAL VERTEBRAE AND ITS POTENTIAL FOR SEX ESTIMATION OF HUMAN SKELETAL REMAINS IN A WHITE SCOTTISH POPULATION

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Abstract: Biological sex determination from skeletal human remains is crucial in archaeological and forensic settings. The purpose of the current study was to evaluate the presence of sexual dimorphism in seven (C1-C7) cervical vertebrae dimensions and to further establish a reliable sex estimation method using C1-C7 for a White Scottish population. In this study, three morphometric characteristics from the cervical vertebrae were measured; maximum vertebral body height (CHT), maximum anterior-posterior diameter of vertebral foramen (CAP) and maximum transverse diameter of vertebral foramen (CTR). One-hundred and fifty (150) cervical vertebrae from a total of twenty-five (25) human cadavers (13 males, 12 females) ranging in ages 49 to 103 years were studied. The resulting statistical analysis showed that CHT measurements exhibited the greatest degree of sexual dimorphism at all cervical vertebral level followed by CTR measurements. CAP measurement only exhibited significant sexual dimorphism at the second cervical vertebra (C2AP). A total of 25 multivariate discriminant functions were generated that were statistically significant and successfully assigned sex with an 81.8% to 100% accuracy range. A cross-validation study was also performed to establish the reliability of the 25 functions and only eight out of 25 functions exhibited weak statistical reliability. Statistically significant sexual dimorphism in the cervical vertebral dimensions (CHT and CTR) was conclusively established with the second cervical vertebrae (C2) exhibiting the greatest sexual variance in the cervical vertebral column of a White Scottish population. Age-related changes were not observed in the vertebral dimensions of the study sample and this may however be due to the insufficient sample size for each age category.

SEX DIFFERENTIATION BY LIP PRINT ANALYSIS IN MALAYSIAN MALAYS POPULATION (KLANG VALLEY): DIRECT PHOTOGRAPHY TECHNIQUE

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Abstract: Cheiloscopy might not as well-known as other human identification methods such as fingerprint or DNA analysis, but it certainly has its own influence when it comes to the right situation. Collecting lip prints from humans using lipstick-cellophane tape technique is acceptable when the number of subjects is considerably low and high quality of lip print impression is desired. However, when large amount of lip print is required for a greater scale study, this particular method becomes time-consuming and labour-intensive, especially when a-trained personnel is required to lift a high quality lip print. Alternatively, lip print can be collected using a mobile-phone camera as done in this study whereby photographs of the subject's lip are captured carefully for a lower cost and more effective collection. Lip prints captured by the camera were analysed using Adobe Photoshop software and classified based on Suzuki and Tsuchihashi classification, into 6 different type of lip print patterns, namely Type I (long vertical), Type I' (short Vertical), Type II (branched), Type III (intersection), Type IV (reticular) and Type V (irregular). The Pearson chi-square test showed that there are significant differences between male and female lip prints in Malaysian Malay population in Klang Valley (p<0.05), and the dominant lip print pattern was type V.

THE EFFECT OF TEMPERATURE AND HUMIDITY ON EVAPORATION RATE AND IGNITION OF RON 95 AND RON 97

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Abstract: Numerous recent fires in Malaysia's gas stations are due to petrol spillage during refueling. This spilt petrol would seep into concrete pavements and would be heated up by the sun to create a rich fuel-air vapour mixture. The mixture is highly ignitable. Therefore, this research was aimed to study factors influencing the evaporation rate and ignition of RON 95 and RON 97. To investigate the effects of temperature, humidity and distance of ignition point on the occurrence of fire in fuel-air mixtures; experiments were carried out in an open environment and a closed chamber with a solid heating device and humidifier. Experimental results showed that when temperature increases from 24 °C to 70 °C, evaporation rate of petrol also increases. However, when relative humidity increases, the presence of water molecules in air will lower down the evaporation rate of petrol. RON 95 has higher evaporation rate compared to RON 97 under controlled temperature and humidity. In addition, the possibility for ignition is high when the distance of ignition point is 2 to 4 cm from the surface of petrol. Overall, the experimental results suggested that evaporation rate of RON 95 and RON 97 is influenced by temperature and humidity. Types of petrol will combine with temperature or relative humidity at 85%, 90% and 95% to affect the evaporation rate of both fuels. Finally, an ignition point of more than 5 cm away from an open spaced petrol surface is considered safe to prevent any untoward fire incidents.

A VIOLENT SCENE OF DEATH - IS IT ALWAYS MURDER?

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Abstract: We presented a case in which investigators found a body under suspicious circumstances. A body of a young gentleman was found in an apartment clad only in shorts. There were multiple injuries on the body. The scene of death was violent and highly suspicious. It was in chaos as if a struggle had occurred in the apartment unit. Blood was pooled all over the floor, and was seen on the walls. To make matters worse, a CCTV recording displayed that another man had entered the unit and left shortly after the police was notified of the death. The man was subsequently apprehended as a 'suspect'. However, autopsy revealed that all injuries were only superficially inflicted and not fatal. Alcohol and narcotics were found in his blood system. Reconstruction of events with the witness and police was suggestive of Excited Delirium Syndrome, which may have been exhibited at the scene .

ESTIMATION OF STATURE FROM HAND AND HANDPRINT ANTHROPOMETRY AMONG TAGALOGS, AN INDIGINEOUS ETHNIC GROUP IN THE PHILIPPINES

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Abstract: Identification of an individual is the most important aspect of forensic investigations. The individual's characteristics can provide useful information in identifying a person. Numerous studies have shown that stature is positively correlated with anthropometric measurements of the hand and handprint. Hence the present study was aimed to develop regression equations to estimate stature from hand and handprint anthropometry among Tagalogs, an indigenous group in the Philippines. The study sample consists of180 males and 180 female Tagalogs, age ranged from 18 to 60 years old withut any hand related diseases. Six measurements were taken from each hand while five measurements were taken from each handprint. Measured data were analyzed using the basic univariate statistics and linear regression analyses. The mean values of stature was 163.04 cm for males and 151.57cm for females. The R-value in males ranges from 0.452 (right handbreadth) to 0.685 (index finger of left hand). The R-value in females ranges from 0.184 (right handbreadth) to 0.671 (index finger of left handprint). The findings were presented in the form of figures and tables. This study provided new forensic standards to estimate stature from hand and handprint dimensions among Tagalogs in forensic perspective.

INFLUENCE OF SHOOTING DISTANCE ON PATTERN DISTRIBUTION OF GUNSHOT RESIDUE

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Abstract: Gunshot residue (GSR) identification provide clues in estimating firing distances, identifying bullet holes, as well as in determination of the ammunition used which leads to the individuals that fired a gun. However, the ability to identify a gunshot residue (GSR) evidence is very crucial part in crime scene investigation. To date, most of GSR analysis were focused on determination of the chemical composition or elements in GSR. In the present study, the pattern distribution of GSR that link to estimation of firing distance, is studied. This study has introduces simple and fast analysis using Video spectral comparator (VSC). Several shooting test has been done in different shooting distance in order to distinguish the differences on pattern distribution of GSR. Based on the results obtained, GSR particle were detected at close range shooting area up to 60 cm. In comparison, shooting test in open area, GSR can only detected at distances below 50 cm. As consequence, visual method of VSC has been successfully used to reveal the GSR pattern distribution on cloth targets.

LINKING SHOOTER AND SHOOTING: DETECTION OF GUNSHOT RESIDUE ON SHOOTER'S HANDS USING MICROSCOPY AND SCANNING ELECTRON MICROSCOPE-ENERGY DISPERSIVE X-RAY METHODS

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Abstract: One important link in the chain of proof during investigation of shooting cases is the evidence to prove a person had fired a firearm, or somehow was connected with the firing activity. Gunshot residues (GSR), particularly on shooter's hand, could provide significant aid in such investigation. Therefore, this study was aimed to investigate the detection of GSR particles recovered from the hands of shooter using two sampling methods, namely stubbing and swabbing, on the basis of the types of firearms and ammunitions, as well as the varying sampling sites. By considering lead, barium and antimony as the criterion to definitely confirm the presence of GSR, the experimental results revealed that greater number of GSR particles was shown in those samples subjected to firing using revolver with .38 SPL ammunition compared to semi-automatic pistol with 9 mm ammunition ($p=$ 0.034). No statistical significant association was evident between the sampling sites and number of GSR particles detected ($p=$ 0.545 for semi-automatic pistol; $p=$ 0.218 for revolver). All stub samples demonstrated positive detection of GSR particles, but only one single characteristic GSR particle was detected on swab samples. Further examination on the collection efficiency of respective sampling methods demonstrated no significant association between the types of firearms and number of GSR particles detected from the respective cartridge cases ($p=$ 0.568). The number of swabbing from spent cartridge case gave almost similar testing result ($p=$ 0.561). This study has successfully detected the presence of GSR particles, which could serve as a supporting evidence to relate a suspect to a shooting case. Although swabbing has limited ability in recovering GSR samples from the hands of shooter, it is useful whenever a stub is not available or to recover GSR particle from a place where could not be reached by a stub, to avoid the loss of trace particles

ISOLATION AND PURIFICATION OF MITRAGYNINE FROM MITRAGYNA SPECIOSA LEAVES

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Abstract: In recent years, Malaysia has seen an increase abuse of psychoactive substances mitragynine (MG), obtained from Mityragyna speciosa leaves. This alarming trend requires a rapid field test (yet to be developed) and robust analytical detection methods which is highly desired by law enforcers and also in forensic laboratory. However, the scarcity and high cost of commercial pure standards can hamper research activities. This study propose the isolation and purification of MG from naturally and locally abundant sources. Methanolic extract of Mityragyna speciosa leaf powder were subjected to solvent extraction followed by purification using SiO_2 column chromatography and collected in gradient solvent systems (chloroloform: ethyl acetate, and methanol: ethyl acetate of different ratio) . All fractions were characterised using Van Urk colour test, thin layer chromatography (TLC) and gas chromatography-flame ionization detector (GC-FID). Positive identification of MG was detected in colour test, TLC and GC-FID for chloroloform : ethyl acetate (9:1) fraction. The GC-FID quantification revealed that the purity of MG from the extract was 51%. Two unidentified alkaloids were also detected with 37% and 12% each. In conclusion, the extraction method used was able to purify MG from local sources which can become a sustainable source of chemical standards. Nonetheless, further optimisation work is needed to increase the purity of isolated substance.

CLASSIFICATION AND DIFFERENTIATION OF CLING FILMS OF VARIOUS BRANDS USING ATTENUATED TOTAL REFLECTANCE-FOURIER TRANSFORM INFRARED SPECTROSCOPY (ATR-FTIR) AND CHEMOMETRICS PROCEDURES

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Abstract: Cling film or cling wrap is either made using polyvinyl chloride (PVC) or low density polyethylene (LDPE) with addition of varying degree of other plasticisers such as diethylhexyladipate (DEHA), polyisobutene (PIB) and polyethylene-vinyl acetate (PEVA). PVC based cling film is much more popular in food services industry due to their superior stretching feature compare to LDPE based cling film which can be purchased by average consumers at their local supermarkets. Cling film is of interest in forensic science as it is commonly used as wrapping for illicit drugs owing to its nature, cost and availability therefore in the event where cling film is found as evidence, the ability to assess the chemical constituents of such cling film would certainly be beneficial in determining its origin. In this study, six different cling films of various brands in which four were purchased from local supermarkets, one from an airport wrapping service and one from hardware store were analysed using ATR-FTIR spectroscopy. Initial physical examinations to the cling films such as their gross appearances and thicknesses did not provide any useful information that could be used to differentiate between them. Manual pattern recognition examinations of their infrared (IR) spectra also revealed quite similar outcomes. On the other hand, chemometrics procedure of principal component analysis (PCA) has successfully classified the cling films into six distinct groups according to their brands and origin with 100% correct cross-validation differentiation by linear discriminant analysis (LDA). This study has demonstrated the effectiveness of combining IR spectra with chemometrics procedures for classification and differentiation of cling films for forensic purposes over physical examinations and manual pattern recognition examinations.

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