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Chemical profiling of volatile organic compounds from shoe odour for personal identification

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EGYPTIAN JOURNAL OF FORENSIC SCIENCES

Volume: 10 Issue: 1

Article Number: 15

DOI: 10.1186/s41935-020-00189-0

Published: JUN 12 2020

Document Type: Article

Abstract

Background Body odour of an individual has a unique composition due to the combined influences of genetic, dietary, and environmental factors. This exploratory study was conducted to investigate the feasibility of obtaining unique chemical signatures of individuals from the shoe odour as a human chemical fingerprint for forensic identification. Methods Five adult males and five adult females participated in this study and provided with two pairs of new canvas sports shoes. The participants were asked to do strenuous activities while wearing the shoes for 2 weeks. Two different extraction methods: swabbing technique, followed with direct extraction using different solvents, and air passive sampling technique, were compared for the effectiveness to extract the volatile organic compounds (VOCs) from the shoes. The variations of VOCs were investigated using gas chromatography coupled with flame ionisation detector (GC-FID), and the resultant chromatogram profiles collected from the shoe odour were further studied for individual identification purposes. In addition, principal component-discriminant analyses (PCA-DA) were then carried out on the GC dataset. Results This study demonstrated that air passive sampling technique using methanol as the extraction solvent was effective for the detection of shoe odour. PCA-DA had successfully distinguished GC profile patterns and discriminated the shoe odour samples accordingly to their owners. The accuracy of DA for classification was 100%, with all samples were classified correctly to their groups. Conclusion The chemical compounds of shoe odour have the potential to be utilised to aid the forensic investigation by identifying and narrowing down the possible suspect if shoes were recovered as evidence at the crime scene.

Keywords

Author Keywords: Body odour; Shoe odour; VOCs; Gas chromatography; Principal component analysis; Discriminant analysis

KeyWords Plus: METABOLISM; SCENT

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Funding

Funding Agency	Grant Number
MOHE FRGS grant	FRGS/1/2019/STG04/USM/02/5

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Categories / Classification

Research Areas: Legal Medicine

Web of Science Categories: Medicine, Legal

Document Information

Language: English

Accession Number: WOS:000540161500001

ISSN: 2090-536X

eISSN: 2090-5939

Other Information

IDS Number: LX9RC

Cited References in Web of Science Core Collection: 46

Times Cited in Web of Science Core Collection: 0

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