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A study on volatile organic compounds emitted by in-vitro lung cancer cultured cells using gas sensor array and SPME-GCMS

By: [Thriumani, R](#) (Thriumani, Reena)^[1]; [Zakaria, A](#) (Zakaria, Ammar)^[1]; [Hashim, YZHY](#) (Hashim, Yumi Zuhanis Has-Yun)^[2,3]; [Jeffree, AI](#) (Jeffree, Amanina Iymia)^[1]; [Helmy, KM](#) (Helmy, Khaled Mohamed)^[4]; [Kamarudin, LM](#) (Kamarudin, Latifah Munirah)^[1]; [Omar, MI](#) (Omar, Mohammad Iqbal)^[1]; [Shakaff, AYM](#) (Shakaff, Ali Yeon Md)^[1]; [Adom, AH](#) (Adom, Abdul Hamid)^[1]; [Persaud, KC](#) (Persaud, Krishna C.)^[5]

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Abstract

Background: Volatile organic compounds (VOCs) emitted from exhaled breath from human bodies have been proven to be a useful source of information for early lung cancer diagnosis. To date, there are still arguable information on the production and origin of significant VOCs of cancer cells. Thus, this study aims to conduct in-vitro experiments involving related cell lines to verify the capability of VOCs in providing information of the cells.

Method: The performances of e-nose technology with different statistical methods to determine the best classifier were conducted and discussed. The gas sensor study has been complemented using solid phase micro-extraction gas chromatography mass spectrometry. For this purpose, the lung cancer cells (A549 and Calu-3) and control cell lines, breast cancer cell (MCF7) and non-cancerous lung cell (WI38VA13) were cultured in growth medium.

Results: This study successfully provided a list of possible volatile organic compounds that can be specific biomarkers for lung cancer, even at the 24th hour of cell growth. Also, the Linear Discriminant Analysis-based One versus All-Support Vector Machine classifier, is able to produce high performance in distinguishing lung cancer from breast cancer cells and normal lung cells.

Conclusion: The findings in this work conclude that the specific VOC released from the cancer cells can act as the odour signature and potentially to be used as non-invasive screening of lung cancer using gas array sensor devices.

Keywords

Author Keywords: E-nose; In-vitro; GCMS-SPME; Lung cancer; VOCs

KeyWords Plus: SOLID-PHASE MICROEXTRACTION; K-NEAREST NEIGHBOR; ELECTRONIC NOSE; MASS-SPECTROMETRY; EXHALED BREATH; BIOMARKERS; CLASSIFICATION; METABOLITES; DIAGNOSIS; RECOGNITION

Author Information

Reprint Address: Thriumani, R; Zakaria, A (reprint author)

+ Univ Malaysia Perlis, Ctr Excellence Adv Sensor Technol, Arau, Perlis, Malaysia.

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- + [2] IIUM, Kulliyyah Engn, Dept Biotechnol Engn, CTCL, Kuala Lumpur, Malaysia
- + [3] IIUM, Int Inst Halal Res & Training INHART, Kuala Lumpur, Malaysia
- [4] Hosp Tuanku Fauziah, Dept Resp, Kangar, Perlis, Malaysia
- + [5] Univ Manchester, Sch Chem Engn & Analyt Sci, Oxford Rd, Manchester, Lancs, England

E-mail Addresses: thriumanireena@yahoo.com; ammarzakaria@unimap.edu.my

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