GC×GC-TOFMS for the investigation of organ specific decomposition odor profiles

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Abstract

Human rescue dog units are the most efficient tool to locate cadavers or people trapped after a natural disaster or catastrophic event. However, training these dogs is extremely time-consuming and expensive. Dog trainers are always looking for a better understanding of the dog olfaction matching to improve their training methods [1]. During training sessions, dogs are commonly trained using body pieces due to the ethical, legal and logistical restriction using whole cadavers. Moreover, commercialized training aid solution are sometimes applied though their compositions and their efficiencies are not worldwide recognized [2]. In this study, the headspace of decomposing human organs was sampled using dynamic pumping to sorbent tubes. Tissue from kidney, liver, lung, heart and blood were stored in glass jars in order to rule out the environmental variabilities (e.g. control on temperature and humidity). The headspace was monitored during the processes of decomposition to establish time-dependent cadaveric VOC profiles and investigate the differences in tissue-specific decomposition. Comprehensive two-dimensional gas chromatography (GC×GC) coupled with time-of-flight mass spectrometry (TOFMS) was applied to the analysis of the emitted volatile organic compounds (VOCs). GC×GC has been proven to be a powerful analytical tool that allows the complete resolution of "the smell of death", i.e. the decomposition odor [3-4].

Univariate and multivariate statistical tools were employed to compare the volatile signature emitted from different organs on different donors. The compounds identified in the headspace were compared with the ones detected in previous studies looking at the decomposition of full bodies to establish a list of putative biomarkers that will further be used for the elaboration of dog training.

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[2] Stadler et al. J. Chrom. A. (2012) 1255, 202-206.

[3] Stefanuto et al. CPC (2014) 79, 786-789.

[4] Perrault et al. J. Sep. Sci. (2015) 38, 73-80.