Cadaveric VOC Profiles for Forensic Investigations

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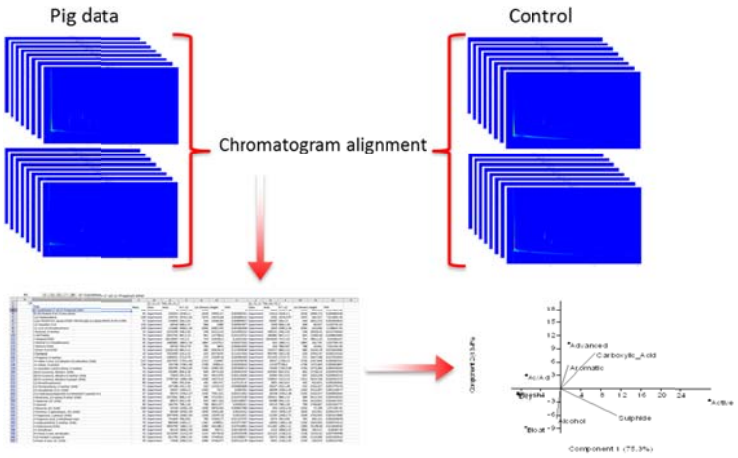
The study of the 'smell of death' is a challenging task. Analytical chemists who try to understand human decomposition are facing very complex mixtures of analytes present at various levels. For the last few decades, investigations have been conducted to better learn the process of body decomposition by mean of the measurement of the Volatile Organic Compounds (VOCs) released during decay[1]. However, the chemical profile of the decomposition odor is still far from being elucidated. Indeed, the complexity of the VOC mixtures makes this profiling difficult to be carried out by a classical gas chromatography mass spectrometry (GC-MS) approach. Human remain detection (HRD) canines are commonly used to locate or trace cadavers, but also to assist in recovering victims of natural disasters. Some artificial scent solutions are available for training purposes, but what dogs are generally educated with are oversimplistic solutions[2]. A better understanding of the VOC profile released by dead or injured bodies could possibly help better design of training solutions for forensic purposes.

Our analytical approach relies on the use of thermal desorption (TD) coupled to comprehensive two-dimensional GC coupled to time-of-flight MS (GC×GC-TOFMS)[3,4,5]. The additional peak capacity of GC×GC, the spectral deconvolution algorithms applied to unskewed mass spectral data, and the use of a robust data mining strategy allows to the generation of characteristic VOC profiles across the various stages of soft-tissue decomposition. Human analogs (Sus domesticus L. carcasses) are used.



Following alignment of data processing tables, statistical information are compared from each class and between classes. Fisher ratios are calculated from the compound table for each analyte in order to identify compounds showing the highest variance. An IS is used to normalize peak areas prior to statistical analysis. Results are exported to external principal components analysis (PCA) software.

This approach is a step forward in producing specific complex odor profiles that could be used in various types of forensic investigations.

1. Vass, A.A. et al. *J Forensic Sci* (2004) 49, 1–10.
2. Stadler, S. et al. *J Chromatogr A (2012)* 1255, 202–206.
3. Brasseur C. et al. *J Chromatogr A (2012)* 1255, 163–170.
4. Dekeirsschieter, J. et al. *PLoS ONE* (2012) 7, e39005.
5. Stadler, S. et al. *Anal Chem* (2013) 85, 998–1005.