DEVELOPING THE SIXTH SENSE OF THANATO-CHEMISTRY

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Thanato-chemistry is a part of forensic sciences that focuses on the monitoring decomposition processes. It studies chemical reactions that take place soon after death. These processes typically conduct to the complete breakdown of the main constituents of a body. One major part of this field is the analysis of the volatile organic compounds (VOC) present in the headspace of decaying bodies. The decomposition odor is made of complex mixtures of such VOCs produced by the chemical degradation of the different tissues of a decaying body. Based on this VOC signature, human remains detection (HRD) canines are trained to locate corpses or injured people trapped during natural disasters[1].

However, the chemical fingerprint of decomposition odor is still far from being resolved. Indeed, the complexity and the large dynamic range linked to decomposition samples overpass the separation power of classical analytical procedures, such as gas chromatography (GC) methods[2,3], for odor analysis. During the last few years, we developed an analytical method, combining headspace sampling, thermal desorption (TD) and comprehensive two-dimensional GC (GC×GC) separation coupled to time-of-flight mass spectrometry (TOFMS). This method was applied to VOC monitoring of various samples linked to the decomposition process. The additional peak capacity of GC×GC, the spectral deconvolution algorithms applied to unskewed mass spectral data, and the use of robust specific data mining strategies allowed the generation of characteristic VOC profiles across the various stages of soft-tissue decomposition[4,5].

Finally, this approach was successfully applied to several kinds of decomposition matrices. First, as the vast majority of cadavers are buried, grave soil samples from human surrogate (pigs) grave were analyzed[1,2]. Open air VOC were also sampled in the headspace of pig and human bodies to try to elucidate what the volatile signature of decomposition was[2,4,5]. Finally, some specific applications such as multi detector computed tomography (MDCT) assisted cadaveric internal gas sampling are under development for forensic embolism detection[6].

References

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