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MONITORING VOCS DURING BLOOD DEGRADATION BY TD-GC×GC-TOFMS WITH VARIABLE-ENERGY ELECTRON IONISATION

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Volatile organic compounds (VOCs) emitted from human blood provide highly valuable information for many forensic applications, including urban search and rescue (USAR) operations. Human remain detection (HRD) dogs are widely used to locate trapped people in collapsed buildings and other structures after the event of a mass disaster or to track missing people during a criminal investigation. The dogs are either trained with natural or artificial material, depending on the legal regulation of the country. Blood is often used as a training aid due to the fact that it is not synthetic and is more easily obtained than whole human bodies or other human tissues. The aim of this study was to contribute to the characterization of current HRD dog training material improving the identification of the blood VOC profile. Thermal desorption – comprehensive two-dimensional gas chromatography – time-of-flight mass spectrometry (TD-GC×GC-TOFMS) with flow modulation and variable-energy electron ionization (EI) was used to monitor VOCs from the headspace of human blood during its degradation. Classical and soft EI (e.g. 70 eV and 14 eV) were applied to each sample in subsequent injections. This allowed effective mass spectral library-searching using classical EI spectra, while providing complementary soft EI spectra, with enhanced molecular ion and reduced fragmentation, for confirmation of compound identity. In addition, the use of flow modulation in comparison to thermal modulation permitted the detection of compounds with low molecular weights, allowing the detection of compounds that may have been previously undetected in the blood VOC profile. The implementation of an internal standard mix allowed semi-quantification of a subset of the detected compounds. This will assist with the development of HRD dog training aids and account for practical improvements in forensic search and recovery procedures.