

## Persistence of decomposition odour in soil analysed by GC×GC-TOFMS

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Cadaver dogs are commonly used to search for human remains deposited on or beneath the ground. The volatile organic compounds (VOCs) evolved from decomposing cadavers are responsible for eliciting a positive canine response. These compounds decline following extensive soft tissue decomposition or animal scavenging. It is thought that soil can act as a repository for VOCs introduced during decomposition and increase the period that a decomposition signature can be detected at a deposition site. The aim of this study was to identify the compounds retained and persistence of such compounds in decomposition soil following a period of soft tissue decomposition and simulated scavenging. Pig carcasses were used as decomposition analogues and were left to decompose on the soil surface in an open woodland research facility in Australia. The remains were artificially scavenged following three months of decomposition, and VOCs were collected onto sorbent tubes from the soil for an additional 7 months thereafter. Thermal desorption – two-dimensional gas chromatography – time of flight mass spectrometry (TD – GC×GC – TOFMS) was used to identify the decomposition VOCs. The results indicate that highly volatile compounds commonly associated with decomposition odour (such as polysulphides) rapidly diminished within 8 weeks. Principal component analysis allowed for identification of compounds exhibiting longer persistence that influenced the decomposition soil, distinguishing it from control sites where no decomposition occurred. The use of TD – GC×GC – TOFMS provided enhanced sensitivity which was required for trace volatile analysis where persistence was of interest involving a removed odour source. The instrument also provided improved peak capacity which was necessary for a complex matrix such as decomposition odour involving a large number of compounds. This study indicates the key compounds that are detectable for extended postmortem intervals in decomposition soil and may be responsible for cadaver dog alerts at sites where remains are no longer present.