



D36 What's That Smell? Odor Composition of Human and Animal Bone Using Gas Chromatography-Mass Spectrometry

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After attending this presentation, attendees will be presented with a comparative analysis of molecular odorants emitted by human and animal bone for potential use in the identification of indistinguishable bone fragments.

This presentation will impact the forensic community and/or humanity by demonstrating research which will further our knowledge of molecular odorants released during bone degradation and provide a database for further research on the volatile(s) used in canine discrimination of bone. The introduction of a new method of odorant sampling has applications in identification of volatiles from a variety of trace evidence sources in addition to classifying fragmentary skeletal remains as human or animal in origin.

It is recognized that well-trained cadaver dogs can distinguish the scent of human remains from those of animals. Cadaver dogs are trained to detect generic air scents common to all human remains; however, whether they respond to an individual, or combination of compounds is unknown. Because cadaver dog can, in some instances, detect skeletonized remains, bone must release volatile compounds forming the basis for this study.

The wet-weight composition of bone is 20-25% organic, 60-65% inorganic, and 10-15% water. Protein hydrolysis in the organic matrix liberates amino acids. Further breakdown of these amino acids results in the release of organic compounds detectable by cadaver dogs enabling them to identify the location of human remains. In nature, most odors are comprised of a mixture of volatile compounds which elicit sensory properties, i.e., molecular odorants. Identification of odorants released by human and animal bone will establish a database useful for compound selection necessary for enhanced cadaver dog training.

Preliminary sampling of bone odor released by human and animal remains indicated spectral differences in composition. Subsequently, eight adult human femora (two of each: male, female, African American, European American) and a tibia or femur from 14 animals—pig, gray fox, raccoon, two dogs, bear, pig, rabbit, two cows, two deer, rabbit, and sheep—were selected from the William M. Bass Forensic Skeletal Collection for further comparison. The bones were placed in Tedlar® sampler bags and filled with compressed air where they remained sealed four to five days. Two liters of air were drawn from the bag through triple sorbent traps (TSTs), concentrating bone-released odorants. The compounds were then thermal desorbed and analyzed using gas chromatography – mass spectroscopy. It is predicted a unique odor signature specific to human skeletal remains will be found for segregation of human from animal bone.

Odor Analysis, Skeletal Remains, Cadaver Dogs