G99 Comparison of Biological Sensors to Detect Human Remains: Canine Versus Hymenopteran

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After attending this presentation, attendees will have a greater understanding of principle of associative learning and its use to train vertebrate and invertebrate species to detect human remains in unknown samples.

This presentation will impact the forensic community by providing information on the use of canines and conditioned insects to screen soil samples for the presence of human remains.

A tremendous amount of effort in the scientific community has focused on deciphering how animals, as well as plants, receive and interpret environmental stimuli. In regards to forensics, these efforts have primarily targeted the development of biological sensors, such as canines, for tracking missing individuals or escapees from custody. Other efforts have evaluated the use of canines to detect explosives or narcotics in places frequented by people.

In recent years the U.S. Department of Defense has initiated research examining the ability of arthropods to detect and locate compounds of human importance. *Microplitis croceipes* has served as a model for a number of studies to detect plant pathogens, explosives, and human remains (Lewis & Martin, 1990; Takasu & Lewis, 1993, 1995, 1996; Rains 2004, 2006). These efforts have translated into the development of a biological sensor that is capable of detection at the nanogram level.

While the use of cadaver dogs in detecting human remains is widely accepted, there is little research that scientifically validates the capabilities or mechanisms by which the dogs function. This study compared cadaver dog performance to that of the trained wasps in terms of threshold and accuracy. Five nationally certified and experienced cadaver dogs with “real world finds” were tested in two types of evaluation paradigms. The cadaver dogs varied in age from three to nine years and consisted of two Border Collies, one Rottweiler, one Laborador Retriever, and one Doberman Pinscher. Cadaver dog threshold was equal to *M. croceipes* as the dogs were able to detect and alert to the presence of human remains using 0.02 grams of soil from beneath a human cadaver mixed with 20 grams of background soil.

Two types of presentation trials were utilized. The first trial set consisted of singular jar presentation in a room. This matched the presentation to the conditioned wasps but was not a traditional method of training or evaluation for testing detector dogs. The second trial, which was conducted upon the end of the first trial, consisted of a scent line-up with all four targets present. Targets were placed approximately three feet apart in a single row line. This is a traditional presentation utilized in research and training of scent dogs.

No type one errors were seen with the dogs; however, there were type II errors. Training biases may account for some of the error margin. Target odors are most often placed into containers for preserving and storing the target for continued use. Preservation of training aids necessitates the use of containers, cages, and other devices which can subsequently become a visual cue for the dog. Most research performed on scent detection dogs involve line ups or concealed target odors to avoid visual cueing. Placing containers in plain sight may have lead to a bias based on expectations by the dog’s previous experience. Cadaver dog training scenarios typically include at least one target odor within a designated search area; therefore the dog is expecting to find something. This defines a need for cadaver handlers to continue to train their canine partners on scenarios involving visual negative targets to reduce association between a visual target and alerting, thereby increasing their efficiency on real world searches.

Cross contamination, residual scent, indoor ventilation systems, and container placement may have also contributed to the type II errors. Cross contamination can also occur due to residual scent. A recent study indicated that dogs can detect human remains odors of human corpses on carpet squares even though the squares did not come into direct contact with the corpse (Oesterhelweg, 2008). Since so little is still known about detector dogs, research that help define thresholds and other factors is essential in increasing the effectiveness of these dogs.

Canine, Microplitis Croceipes, Biological Sensor

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