E20 Characterization of Controlled Odor Mimic Permeation Systems (COMPS) Containing Live Training Aids for Utilization by Detection Canines

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After attending this presentation, attendees will understand: (1) current processes of training detector canines for food safety; (2) how training aids are created for live target odors; and, (3) how COMPS can be used as effective alternatives for which no other containment system is available.

This presentation will impact the forensic science community by presenting a method of strengthening pre-existing canine detection in forensic science and food safety through the characterization of the Volatile Organic Compounds (VOCs) in the headspace of canine training aids containing an invasive biological threat for the protection of natural resources.

Food safety is gaining attention on the national platform because of the risk that various biological threats pose to these national resources and the economy. Since 1984, the United States Department of Agriculture (USDA) successfully used canine detection to decrease the number of biothreats entering the country, but it cannot completely stop these threats due to the volume of activity at various ports of entry. One of the biggest reasons detection canines are not applied more to the food safety field is the lack of efficient and safe training aids. Generally, for biological threats, training aids are live, which poses many dilemmas, such as shelf-life, cost, and difficulty of obtainning and containing the target odor. For invasive species, additional risks include the rarity of the species as well as the legality of obtaining and transporting it. Common alternative training aids include nests, burrows, and objects left behind by the target, such as scat, carcasses, or feathers; however, for many invasive species and pests, these alternatives are not possible. This study used the invasive fungus *Raffaelea lauricola* as a proof of concept to illustrate how COMPS can be used as effective containment devices for biological threats such as fungi, whose spores are easily spread, but for which no other alternative exists.

R. lauricola entered the United States through Georgia in the early 2000s on infected wooden shipping pallets, carried by its vector, *Xyleborus glabratus*, or the Redbay Ambrosia Beetle (RAB). This fungus and its host spread through eight states in the southeastern region of the nation, infecting members of the Lauraceae family, including commercial and private avocado trees. In the decade since it entered the United States, *R. lauricola* has killed 12,000 commercial avocado trees in Miami-Dade County, FL alone. The fungus also poses a huge risk to the 250,000 privately owned avocado trees in Miami-Dade County. Thanks to the rapid spread of the pathogen, the food safety of California and Mexico are also at risk. *R. lauricola* causes laurel wilt disease, which kills trees within six weeks of inoculation and rapidly spreads to its neighbors through the process referred to as root grafting. The trees over-respond to the threat by shutting down their vascular system in an attempt to stop the spread of the disease; however, this ill-fated attempt at defense shuts down the water and nutrient transportation systems of the vascular tissue, leading to tree death. An infected tree displays dark discoloration of the xylem, wilted yellow to brown leaves, and frass on the trunk from increased insect activity. The only current method of early disease identification is canine detection.

The detector canines trained to locate infected avocado trees are trained using COMPS-containing infected wood. This study demonstrated that COMPS effectively contain the fungal spores while allowing for the release of

target odors. First, VOCs released from the COMPS were detected and compared to those released from samples of live infected trees. Then, the dissipation rate was determined so shelf-life could be established. Externally Sampled Internal Standard-Solid Phase Microextraction/Gas Chromatography/Mass Spectrometry (ESIS-SPME/GC/MS) was used as the extraction and analytical method. The characterization of these COMPS demonstrated that COMPS can be used as effective containment devices for many biological threats for which alternative training aids do not exist. This containment method can be used to expand the field of detector canines to protect against the rising threats to food safety.

COMPS, Canine Detection, Food Safety