B27 Chemical and Canine Analysis as Complementary Techniques for the Identification of Active Odors in a Biothreat Agent

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After attending this presentation, attendees will better understand the biothreat agent *Raffaelea lauricola*, which causes the lethal laurel wilt disease. Attendees will understand how research is combating the spread of this fungus by using a combination of chemical analysis and canine trials to identify the active odors and create a safer, longer-lasting training aid.

This presentation will impact the forensic science community by introducing a novel method of identifying active odors to be used in the field of forensic canines in order to prevent the spread of *R. lauricola* through canine detection. This presentation will also strengthen the validity of canine detection as it is currently used in forensic science.

Canines have served an integral part of forensic science for more than a century, yet there is little science to support their ability to distinguish Volatile Organic Compounds (VOCs) of illegal or controlled substances. By identifying the odors to which canines alert, it is possible to create safer, longer-lasting training aids, as well as provide scientific support in legal proceedings. In the case of the invasive biothreat agent *R. lauricola*, canines are currently the only method of early detection. *R. lauricola* is a fungus that was brought into the country in the early 2000s and is currently devastating avocado groves in the United States. It causes the laurel wilt disease that kills trees within six weeks. The fungus is carried by an invasive beetle (*Xyleborus glabratus*) which bores into a host tree and farms the phytopathogenic fungus as food. The tree attempts to halt the spread of the fungus by systematically shutting down its respiratory system, which unintentionally stops the spread of nutrients and water and kills the tree. Once a biothreat or other banned agricultural item has entered the country, there is no established, uniform method of eradication.

The current study used Solid Phase Microextraction/Gas Chromatography/Mass Spectrometry (SPME/GC/MS) to identify the odors present in avocado trees infected with the pathogen. Twenty-eight compounds were identified using this method; however, most of these compounds were not commercially available. In order to create a training aid for canines trained to detect *R. lauricola*, the compounds the canines are alerting to had to be identified. To this end, two separate canine trials were completed. First, four canines were run on Controlled Odor Mimic Permeation Systems (COMPS) made of infected tree wood, uninfected tree wood, and fungus cultures. All canines successfully alerted to infected tree wood and fungus cultures, but not uninfected tree wood, proving that the canines are alerting to fungal odors present in infected trees with a positive predictive value of 98.3%. The second trial was designed to identify these odors without the assistance of pure compounds, since they are not commercially available. By venting a GC column to the atmosphere, fractions of the chromatograph were collected. These fractions were presented to the canines in a series of trials, resulting in the identification of a portion of chromatogram that the canines alert to as active odors for the biothreat *R. lauricola*. Using the fraction identified by the canines, an environmentally safe and longer-lasting training aid will be created. Additionally, a new method of odor identification was created for future use in the field of forensic canines.

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