D48 Canine and SPME/GC/MS Detection of Microbial Volatile Organic Compounds Emitted From *Stachybotrys chartarum, Penecillium chrysogenum* and *Aspergillus versicolor*

Robert T. Griffith, BS, Kenneth G. Furton, PhD, and Krish Jayachandran, PhD, Florida International University, CP 345, 11200 Southwest 8 Street, Miami, FL 33199; and William Whitstine, Mold Dog, Inc., 716 2nd Street, North, Safety Harbor, FL 34695*

After attending this presentation, attendees will understand the process of mold detection by the identification of microbial volatile organic compounds. This presentation will impact the forensic community and/or humanity by educating the forensic community on the work being done on validating mold detection processes via canine and SPME/GC/MS analysis.

Indoor mold growth is a serious problem all over the world. Mold exposure has been linked to acute and chronic adverse health effects and even death in humans and animals. These adverse health effects vary depending on the levels of exposure and the strength of one's immune response, but may include vomiting, hemorrhaging, chest pain, nephritic congestion, and necrosis of tissues. Certain molds even have carcinogenic potential. Mold spores are airborne particles, which can travel into virtually any environment and are often deposited indoors. The growth of mold is dependent on humidity, temperature, and a supply of nonliving organic material, which serves as a nutrient source. When adequate conditions exist, mold is able to flourish, often undetected. As it grows, mold produces several types of secondary metabolites, namely antibiotics, mycotoxins, and microbial volatile organic compounds (MVOCs). Mycotoxins are the most toxic of the fungal secondary metabolites, but are generally nonvolatile, as they are relatively large molecules. The volatile secondary metabolites, MVOCs, are emitted from flourishing molds, and may be species-specific. It may be possible to detect fungal growth down to the species level based on the composition of the microbial volatile organic compounds emitted from a culture.

Law-enforcement agencies, forensic scientists, and the military have used canine detection for many years throughout the world. Canis familiaris, or domesticated dogs, have been specially trained to detect a variety of target compounds emitted from the source via olfaction, whether it be ignitable liquid residues, volatile compounds from explosives, or degradation products from human remains. Canines display an ability to discriminate between similar or partial odor signatures, so it is important to know the complete volatile composition of what is being detected. The advanced olfactory system canines possess allow them to detect compounds down to the parts-per-billion level, significantly past the point where human olfactory capabilities fail. This study is researching what target compounds are being emitted from three problematic species of molds: *Stachybotrys chartarum*, *Aspergillus versicolor*, and *Penecillium chrysogenum*.

Cultures of *Stachybotrys chartarum*, *Aspergillus versicolor*, and *Penecillium chrysogenum* were obtained from ATTC in Manassas, Virginia. Samples of each species were grown in vitro and purified in the laboratory. *Stachybotrys chartarum* was grown and purified on corn meal agar; *Apergillus versicolor* and *Penecillium chrysogenum* were grown and purified on potato dextrose agar. All samples were cultured in triplicate. Headspace analysis was conducted using solid phase microextraction/gas chromatography/mass spectrometry to determine the specific odor signatures of the volatile metabolites for each species. Species-specific mold drywall training aids were obtained from a local canine training facility and headspace analysis was conducted using solid phase microextraction/ gas chromatography/mass spectrometry as well. Sample extraction conditions were optimized by varying the fiber types, the time of sample exposure, and the amount of sample being analyzed.

This study aims to address the effect of varying concentrations of molds and length of time molds are allowed to grow on the odor signatures obtained via SPME/GC/MS analysis for both the pure mold cultures and the inoculated drywall training aids. Also, by contrasting the spectra obtained from SPME/GC/MS analysis of the headspace of the pure mold cultures and the drywall-inoculated training aids, it could be determined what compounds specifically the canines are being trained to detect, thereby enabling a critique/validation of the training process which canines are undergoing today in the mold detection industry.

Microbial Volatile Organic Compounds, Canine Detection, SPME/GC/MS Detection

 ** Presenting Author*