B124 Identification of Odor Signature Chemicals Used by Detector Dogs to Locate Drugs and Items Containing Drug Odors Including Currency

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This paper describes the identification and quantification of odor signatures used by detector dogs to locate controlled substances and the significance of these finding in confirming dog alerts to items associated with controlled substances including currency

This presentation will demonstrate that law enforcement detector dogs are trained to alert to significant quantities of unique odor chemicals associated with controlled substances and not found in common over the counter preparations or circulated currency thus strengthening the value of dog alerts to items as part of an investigation.

This paper describes the use of headspace solid-phase microextraction (SPME) combined with gas chromatography mass spectrometry (GC/MS) to identify the signature odors that law enforcement certified detector dogs alert to when searching for drugs. Background information is provided on the many types of detector dogs available and specific samples highlighted in this paper are the drugs cocaine and 3,4Methylenedioxy-N-Methylamphetamine (MDMA or Ecstasy). Studies include the analysis and identification of the headspace (fingerprint) of a variety of samples, followed by completion of double-blind dog trials of the individual components in an attempt to isolate and understand the target compounds that dogs alert to. SPME/GC/MS has been demonstrated to have a unique capability for the extraction of volatiles from the headspace of forensic specimens and shows great potential to aid in the investigation and understanding of the complicated process of canine odor detection. Major variables evaluated for the headspace SPME included fiber chemistry and a variety of sampling times ranging from several hours to several seconds and the resultant effect on ratios of isolated volatile components. CW/DVB and PDMS SPME fibers proved to be the optimal fiber types. Field studies with detector dogs have demonstrated possible candidates for new pseudo scents as well as the potential use of controlled permeation devices as non-hazardous training aids providing consistent permeation of target odors.

The results demonstrate that SPME/GC/MS combined with field tests using certified detector dogs is an effective method for identifying active odor signature chemicals in forensic specimens. For the drug studies it was found that passive adsorption using DFLEX devices containing activated charcoal was not sensitive enough to recover signature odors from the headspace of MDMA tablets. Only when very large samples (i.e., greater than 250 grams) were extracted for extended periods of time (i.e., 1 week) were odors reliably detected. However, with headspace SPME it was found that with the implemented use of the CW/DVB and PDMS fibers with 3 hour extraction times it was possible to obtain consistent signature odors from the headspace of a single MDMA tablet. Many compounds of interest were found to be present in the headspace composition of the MDMA tablets tested, including piperonal, MD-P2P and methamphetamine. Through examinations of different tablets, however, it was concluded that the metamphetamine found within certain tablets were present due to its addition as an impurity or adulterant and not the direct result of synthetic manufacturing and that piperonal and MD-P2P were the common chemicals seen in all samples tested.

In studies where different over the counter tablets were analyzed, it was concluded that none of the headspace compounds found within these tablets were present in the headspace of MDMA tablets, therefore making the possibility of false positive alerts from the canines in association with these commonly encountered tablets unlikely. Field studies directly focusing on the signature odor of MDMA have shown that canines are alerting to approximately 10 ¡V 100 mg of the piperonal compound that is found exclusively in MDMA tablets. Since MDMA manufactured through different synthetic routes can yield different signature chemicals, it is important to perform ongoing studies of headspace odors from current street samples and more than one MDMA training aid may be required for optimal performance in the future.

The dominant cocaine odor chemical has been confirmed to be methyl benzoate via spiked samples as well as controlled delivery devices with threshold levels of 1-10ng spiked methyl benzoate or 0.1-1 ng/sec odor diffusion. The evaporation rate of methyl benzoate from circulated and uncirculated U.S. currency has also been studied in detail. The amount of methyl benzoate on currency decreased exponentially. Evaporation rates varied considerably (2 to 2000 ng/sec) depending on conditions, decreasing with increasing number of bills and the covering of the currency. The levels of signature odor chemicals needed to initiate consistent alerts from law enforcement detector dogs and the lack of significant levels of these chemicals in common over the counter items or circulated currency enhances the significance of dog alerts to items as part of an investigation.

Drugs, Detector Dogs, Currency

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