B14 False Positive and False Negative Rates for Canine Detection of Ignitable Liquids

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After attending this presentation, attendees will appreciate the impor- tance of independent testing of canines used in arson investigation as to their false positive and false negative rates for a variety of liquids. In addition they will learn that continued training of canines with a variety of ignitable liquids is key in minimizing false negatives as well as false positives.

This presentation will impact the forensic community and/or humanity by demonstrating the importance of testing canines used in arson investigation to determine false positive and false negative rates.

Canines have been used with great success by arson investigators in selecting sites for sample collection at suspicious fires. However, there have been court challenges to admissibility of testimony by handlers under *Frye* and *Daubert* regarding the canines' alerts. This is of interest when the alert is not confirmed by laboratory results. The purpose of this research was to establish the sensitivity of two canines to a variety of ignitable liquids and determine the false positive and false negative rates for each. Ignitable liquids tested included 50% and 90% evaporated gasoline, diesel fuel, lacquer thinner (a blend isopars, ketones and other oxygentated products), turpentine and odorless lamp oil (a normal paraffin product). Levels of each liquid from 0.05 to 5.0 µL in a one-quart lined paint can. Charred chipped foam carpet pad was used as a substrate to provide a low- level pyrolysis product background. An equal number of 'blank' cans containing only charred carpet pad were used to determine false positive rates. The handlers did not know which cans contained which liquid or blank. A series of 6 cans were randomly selected and present to the canine. Each set of six cans was tested with three passes by a canine with rearrangement of the cans between passes. A rest period was allowed between sets. Laboratory confirmation of the presence and identity of the ignitable liquid was made using the passive adsorption on activated charcoal strip (ASTM E-1412-00) and gas chromatography/mass spec- trometry (ASTM E-1618-01).

Both canines had been initially trained using a variety of ignitable liquids, but daily training used only 50% evaporated gasoline. Lamp oil being a normal paraffin product should present the greatest challenge to the canines because it lacks aromatics or isopars found in a number of other products. Turpentine is the product of destructive distillation of yellow pine and contains terpenoids that are also found in the pyrolysis products of pine commonly used in home construction, thus, at low levels, would be often present in many fire debris samples. A canine should be trained to ignore low levels of terpenoids to avoid excessive 'false positives'. Laboratory analysis detected and identified all ignitable liquids down to 0.05 µL.

A false negative was observed for 50% gasoline at the 0.5 µL level by one canine, although she correctly alerted to the same liquid at lower levels. Her response was consistent for each of the three passes. A false positive on one pass was noted for one blank sample. Although the cans were a minimum of 24 inches apart, it is possible that odor from a high level nearby may have triggered the false response. The second dog sporadically hit on the lamp oil samples; however, it consistently responded to the tur- pentine samples except for the lowest level (0.05 µL). This dog was not trained on turpentine. Lacquer thinner was ignored by this dog at all levels. He was not trained on oxygenates so could be expected to miss those in the lacquer thinner; however, isoparaffins were observed in the GCMS analysis which are in some solvents used in his training regime. Toluene was listed on the container as a component, but this was notably absent in the chro- matogram. The second dog also had several false positives on two of the blank samples. Lab analysis of this blank sample was incomplete at the abstract deadline.

Canine Detection, Arson, Ignitable Liquids

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