B104 Comparison of Field Portable Instruments and Accelerant Detection Canines for the Detection and Collection of Ignitable Liquid Residues at Fire Scenes

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This presentation will demonstrate a complementary method used in the search for ignitable liquid residues (ILR) at fire scenes when Accelerant Detection Canines (ADCs) are not available, or when the hazards of the scene prevent the use of such dogs, while maintaining the sensitivity and selectivity of ADCs. In addition, an investigation into the use of an on-site portable ILR sampler for the separation and extraction of volatile accelerants will be discussed. It is proposed that this method would hopefully simplify the collection and transportation of samples from fire debris for subsequent chromatographic analysis in the laboratory.

This presentation will demonstrate the practicality of using these portable detectors for fire/arson investigators to detect the use of accelerants at a fire scene, and to collect adequate samples for submission to a forensic laboratory for analysis.

Arson, the intentional burning of property, is a serious crime in many countries including the United States. The use of flammable liquids is a frequent choice for arsonists to help accelerate the spread of a fire. One of the responsibilities of the fire investigator is to look for signs of accelerant use that could have started these incendiary fires. Chemical analysis of accelerant residues in the fire debris would assist the investigator in determining if the fire was due to intentional or natural causes.

It is well known that dogs have superior olfactory capabilities, thus Accelerant Detection Canines (ADCs) have been employed at some fire scenes to pinpoint locations where flammable liquids had been used. It has been reported that ADCs can distinguish between some accelerants and interfering pyrolysis products of common materials found at the fire scene. Not only are they able to discriminate between the accelerants and pyrolysis products, but it has also been reported that ADCs can detect down to levels below the sensitivity limits of analytical instruments used in forensic laboratories. Although accelerant detection canines have been involved in court cases in the United States, there have also been controversies over admissibility of canine testimony. Unless confirmed by laboratory analysis, canine alerts would raise a reliability issue in court.

A complement to using these biological detectors is to use electronic sniffers. The purpose of this study is to determine the capability of one such on-site electronic detector compared to ADCs. The TLV Sniffer® (Scott Instruments) is used to detect the presence of combustible gases. This instrument was put through similar proficiency tests that accelerant detection canines perform, as outlined by the Canine Accelerant Detection Association (CADA).

Since the TLV Sniffer® is designed to detect and measure concentrations of combustible gases, it will also indicate the presence of hydrocarbons from pyrolysis products. For confirmatory purposes, another field instrument was considered. The Portable Arson Sampler (PAS) separates and collects volatile accelerants from the fire debris. Ideally, one would use the TLV Sniffer® to first locate the source(s) of accelerants among the fire debris. Once located, the PAS would be used to sample the headspace of that fire debris and extract the volatile gases onto adsorbent tubes. The contents of the tubes would then be chemically or thermally desorbed for subsequent gas chromatography-mass spectrometry (GC/MS) analysis at the laboratory.

To study the selectivity of the TLV Sniffer®, various substances that could be found at a fire scene, including pinewood, Styrofoam, newspaper, and nylon carpet, were set on fire. Comparisons between fires that were extinguished by oxygen deprivation and by dousing with water were carried out. Headspace analyses of these burned matrices were conducted, both with and without being spiked with 5uL 50% weathered gasoline.

Results show that the weathered gasoline can still be detected under both extinguishment conditions, even after air venting for 30 minutes. Burnt wood, nylon carpet, and Styrofoam produce pyrolysis products, but these would not be confused with gasoline once analyzed by GC/MS. However, burned black and white newsprint paper generates common compounds also present in gasoline. But to a skilled analyst, their chromatograms would not be mistaken due to the ratios and patterns of the peaks generated by gasoline. A problem may arise, however, when the sample has been air vented for 30 minutes or more, as most of the alkylbenzenes of gasoline will have evaporated. Thus there is a need for adequate comparison samples to act as a negative control. Overall, these results indicate that electronic sniffers and adsorption samplers can be useful complements to ADCs, as they offer an objective qualitative analysis which can be used in a court of law. In addition, there are advantages of the on-site sampling capabilities offered by the PAS including reduction to loss of sample, less bulky packaging sent to the laboratory, and the ability to sample from areas that cannot be conveniently transported to the laboratory.

Arson Investigation, Electronic Detectors, Accelerant Detection Canines

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