



### **B40 A Comprehensive Study of the Scientific Foundation of Explosive Detector Dog Performance**

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This presentation will outline the research approach presently being performed for the scientific validation of detector dog performance for the detection of explosives. Research currently focuses upon the vapor headspace analysis of a variety of explosives by SPME-GC/MS to facilitate dog trials of individual headspace components. A closer look has also been taken at the analysis of explosives and blast debris by SPME-GC/MS/MS.

Analysis and identification of the headspace 'fingerprint' of a variety of explosives, followed by double-blind dog trials of the individual components have been performed in an attempt to isolate and understand the target compounds to which the dog is sensitive. Studies to compare commonly used training aids with the actual target explosive have also been undertaken to determine suitability and effectiveness.

The vapor headspace of a range of explosives have been analyzed using non-equilibrium rapid Solid Phase Micro Extraction GC/MS. Samples of a variety of explosives have been obtained from local law enforcement agencies for odor signature determination. The odor signature have been tested at time intervals to observe sample degradation under different conditions to study any effect that this may have on the dogs' detection performance.

Studies have also been performed using HPLC/MS to observe the non-volatiles within the samples. Diffusion studies are executed to observe the production and maintenance of an active odor headspace above the explosive media.

Following successful characterization of the odor signatures of the explosives, attention is then turned to the canine detection through a combination of double-blind trials of individual components from the odor signature. This work will facilitate a better understanding of the active odor compounds and how they may be exploited to advance the field of explosive detection.

Statistical analysis includes Method Detection Limit calculations, Vapor Pressures and Diffusion Constant studies of selected explosives related to canine sensitivity.

SPME has been demonstrated to have a unique capability for the extraction of volatiles from the headspace of ignitable liquids and explosives. Furthermore it has been shown to reduce the sampling of background matter from multifarious debris sample matrices. Results to date have shown comparable differences between readily available training aids and the actual explosive matrices that they seek to replicate.

SPME-GC/MS shows great potential to aid in the investigation and understanding of the complicated process of canine odor detection.

#### **SPME-GCMS, Explosives, Canine Detection**