## B103 Continued Scientific Investigation of Explosives Detection by *Canis Lupis var. familiaris*

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This presentation will provide a better understanding of canine detection best practices. Acceptance of the differences between canine training with real explosives or simulated training aids and the impact that this can have on the quality of the canine performance.

This presentation will communicate the continuation of previous work by the authors, focused upon identification of the active odour signatures of explosives, detailing the new results and broadening the scope of samples studied to included explosives not previously presented. With a view to better understand and give scientific validation to biological detection of explosives by detector dogs, this work continues with more odours identified and currently under investigation.

Another area of work appropriate to this study is the diffusion of explosive odors though a variety of polymers. It is proposed that through appropriate choices of plastic material, the target odor may be released at a controlled rate to produce a highly effective training aid. Gravitometric studies into the loss of explosive material from polymer packaging are also presented in this paper.

The analysis and characterization of the headspace 'fingerprint' of a variety of explosives, followed by canine trials of the individual components to isolate and understand the target compounds that the dogs alert to. Studies to compare commonly used training aids with the actual target explosive have also been undertaken to determine suitability and effectiveness. The reliability of commercially available canine training aids is investigated

The vapor headspaces of a range of explosives have been collected using Solid Phase Micro Extraction (SPME) and analyzed by chromatography-mass spectrometry. Using SPME-GC-MS, samples of a variety of explosives obtained from local law enforcement agencies for odor determination have been characterized, and the prevalent signature odor chemicals identified. Studies have also been performed using SPME-HPLC-MS to observe the non-volatiles, and thermally unstable compounds within the samples.

Following the characterization of the potential odor signatures of the explosives, canine detection is then applied to a combination of double-blind trials of the individual components from the odor signature. The chemicals identified by canine trial are then packaged in a variety of polymer bags, as prototype designs for safe, inactive training aids

SPME has been demonstrated to have a unique capability for the extraction of volatiles from the headspace of explosives. Results to date have shown comparable, chemical differences between readily available training aids and the actual explosive matrices that they seek to replicate. Odor signatures of TNT, RDX based plastic explosives, and assorted propellants are presented.

Current work, including recent dog trials, has confirmed the hypotheses that 2,4-DNT and 2-Ethyl-1-hexanol are the active odor signatures of TNT and C-4/Plastic Explosives respectively. Dog trials have also discounted the taggant DNDMB, and diphenylamine as previously proposed active odor signatures for C-4/Plastic Explosives and Smokeless Powder respectively. Investigation into the effectiveness of commercially available training aids has highlighted several major concerns regarding the suitability of the aids, and their simulated odors, regarding canine training.

**Canine Detection, Explosives, SPME-GC-MS**

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