



B11 Development of Scientifically Sound Protocols for the Training of Explosive Detection Canines

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After attending this presentation, attendees will understand scientifically sound protocols for training and maintaining explosive detection canines, in addition to a rapid vapor analysis technique for explosives detection and analysis.

The presentation should allow members of the forensic community who are not familiar with canine detection to become familiar with the abilities and limitations of explosives detection canines, whilst at the same time providing specific scientific suggestions to those in the field who wish to improve upon training and operating practices.

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The use of canines as a method of detection of explosives is well established worldwide and those applying this technology range from police forces & law enforcement to humanitarian agencies in the developing world. For those not involved in the legal aspect of explosive detection such as charities and the military whose sole interest in canine detection is to efficiently locate mines and other explosive devices, the anecdotal evidence of canine success is sufficient to justify their use, but for law enforcement and homeland security, far more than anecdotes are required to make it to the courtroom.

Despite the recent surge in publication of novel instrumental sensors for explosives detection, canines are still regarded by many to be the most effective real-time field method of explosives detection. However, unlike instrumental methods, it is difficult to determine detection levels, perform calibration of the canines' ability or produce scientifically valid quality control checks.

Canine detection of explosives relies upon the dogs' ability to equate finding a given explosive odor with a reward, usually in the form of praise or play. The selection of explosives upon which the dogs are trained thus determines which explosives the canines can and potentially cannot find. It follows that one of two possible scenarios is responsible for the canines' selectivity and specificity to explosive odors; (i) that canines alert to the parent explosives regardless of their volatility, or (ii) that canines alert to more volatile, non-explosive chemicals that are present in explosives, and which are characteristic to explosives.

The Bureau of Alcohol, Tobacco, Firearms and Explosives lists over 250 different explosive materials on the Federal Register, not including mixtures and improvised devices. An explosive detection canine must be capable of finding all explosive devices; however, it is impractical to train the dog on every individual odor. Commonly, the training is focused towards high explosives such as TNT and Composition 4 (C-4), and the low explosives such as Black and Smokeless Powders are added often only for completeness. However, powder explosives constitute a major component of explosive incidents throughout the US, and canines trained to detect explosives must be proficient across the entire range of powder products. With the variability in the manufacture and product make-up many smokeless powders do not share common odor chemicals, giving rise to concerns over the extensiveness of canine training.

Through Solid Phase Microextraction (SPME) combined with Gas Chromatography - Mass Spectrometry (GC-MS) and Electron Capture Detection (GC-ECD), it will be demonstrated that many TNT and cast explosives share a common odor signature, and that the same may be said for plasticized explosives such as C-4 and Deta-Sheet. Conversely, smokeless powders may be demonstrated not to share common odors. The implications of the odor differences and similarities on the selection of the optimal explosives upon which to train the canines will be discussed.

Explosives, Canine Detection, Homeland Security