NIST nose a hit when they smell it: A new generation of odor-releasing materials for training dogs

September 17 2013

Federal police officer Donald Strawsburg puts his bomb-sniffing buddy and K-9 officer Banjo through his paces using the NIST-developed training tool. For the purposes of this exercise, the odor-releasing material has been infused with the vapor profile of PETN, a major component of many plastic explosives. Credit: Talbott/NIST

Traditionally, the training of bomb-sniffing dogs has been a hazardous job, but newly developed odor-releasing materials could take the risk out of that work. Scientists at the National Institute of Standards and Technology (NIST) are seeking to patent a novel system that can capture scents and release them over time.

These odor-releasing materials provide a safer, more consistent way to train the dogs used by police agencies to sniff out explosives and other

contraband. The inventors at NIST hope to eliminate the need to transport, handle, or in some cases manufacture actual samples of explosives and other illicit or dangerous substances, an expensive and time-consuming task due to chain of custody requirements and safety concerns.

Dogs have an incredible sense of smell that can detect certain compounds at parts per trillion. This feat is the equivalent of tasting about a quarter teaspoon of sugar dissolved in an Olympic-sized swimming pool. This ability makes dogs invaluable to law enforcement and customs and border protection, and greatly surpasses efforts to date to replicate with portable detectors. Still, a talented nose is not enough; dogs need training and practice if they are to perform at their best.

According to NIST chemist and co-inventor of the new system Bill MacCrehan, police dogs are presently trained to sniff out explosives using actual explosives. In practical terms, this means that the materials have to be transported to the site, stored in a secure, explosion-proof location, documented before and after each use, and destroyed when they have expired.

Test container of the NIST odor-releasing material hiding in a pail waiting to be discovered. Credit: Talbott/NIST

The new system developed by MacCrehan and his collaborators uses a porous plastic with a consistency similar to a popular gelatin-based dessert. The plastic absorbs smells by being exposed to, or otherwise infused with, the volatile vapors of the desired sample material itself or chemical analogues, or "smell-alikes," that have been synthesized in the lab.

"In addition to standard materials, we can build training aids for exotic things that are not easily accessible; the prime example is the improvised explosive TATP," says MacCrehan. "Preparing pure improvised explosives for dog training has proven to be very dangerous. Inert materials that provide the correct odors is the answer to this improvised explosive dilemma."

According to MacCrehan, once the polymer is infused with the odor, it can be shipped anywhere safely and easily, because while the polymer is infused with the volatile compounds of an explosive, the polymer itself does not become explosive. An additional safety feature of this approach is that the infused molecules cannot be extracted from the polymer to create an explosive.

Once the sample is put into the testing environment, the rate at which the odor is released into the air can be precisely controlled using the accompanying enclosure and can be sustained 11 days or more, depending on the vapor profile.

Another critical advantage of the system is that it will make it possible to achieve uniformity in training.

"Right now, dogs are trained by local police departments using real samples of varying age and composition, which can affect their vapor profiles," says MacCrehan. "This means that dogs trained in different jurisdictions will perform differently because they are not evaluated using the same performance standard. Identical training standards will make it so that dogs across jurisdictions can be trained to the same high level."

Provided by National Institute of Standards and Technology