

# Trained wasps may be used to detect bombs, bugs, bodies and more

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An unusual device that uses trained wasps, rather than trained dogs, to detect specific chemical odors could one day be used to find hidden explosives, plant diseases, illegal drugs, cancer and even buried bodies, according to a joint study by researchers at the University of Georgia and U.S. Department of Agriculture.

The trained wasps are contained in a cup-sized device, called a "Wasp Hound," that is capable of sounding an alarm or triggering a visual signal, such as a flashing light, when the insects encounter a target odor. The sensor is cheaper to use than trained dogs and more sensitive than some sophisticated chemical detection methods, including electronic noses, the researchers say. Their experimental device is described in a study slated to be published in the Jan.-Feb. issue of *Biotechnology Progress*, a joint publication of the American Chemical Society and the American Institute of Chemical Engineers.

The idea of using unconventional biological sensors to detect target odors is not new, according to study leaders Glen C. Rains, Ph.D., a biological engineer with the University of Georgia in Tifton, Ga., and W. Joe Lewis, Ph.D., a research entomologist with the USDA's Agricultural Research Service, also in Tifton. Rats, honeybees, fish and even yeasts have all been used experimentally to detect various explosives or toxins, they say.

"We've now developed a prototype device that puts the idea of using chemical-sensing wasps into a practical framework and its possibilities

are astounding," says Rains, who believes that the device could be ready for commercialization in five to ten years. Like batteries in a smoke detector, the trained wasps won't live forever and will eventually have to be replaced, he says.

In the current study, the researchers used *Microplitis croceipes*, a species of tiny parasitic wasps that can be trained to detect certain odors by associating the odors with a food reward. The wasps are not capable of stinging humans, the scientists say. Training a single wasp to detect a target odor can take as little as five minutes and the insects can be easily bred by the thousands, they say.

The research team developed a special ventilated device, composed of PVC pipe, which holds a small cartridge containing five trained wasps. The wasps were trained to detect 3-octanone, a chemical produced by certain toxic fungi that infect corn and peanut crops. The presence of the fungi can result in costly crop losses.

The Wasp Hound contains a tiny camera that is linked to a computer to record the movement of the wasps. In a controlled test, the device was exposed to batches of dried feed corn containing either the target chemical, myrcene (a compound of neutral interest to the wasps) or corn alone. In comparison to a group of untrained wasps, the trained wasps showed significantly stronger behavioral responses to the target odor than to the myrcene and control treatments. Responses include moving toward the target odor source and congregating around the device's odor inlet. This movement can be translated into an alarm signal to indicate the presence of a toxic plant fungus, the scientists say.

Besides detecting plant diseases, the device has a wide variety of other potential applications. In previous studies, the researchers demonstrated that they also could train the wasps to detect 2,4-dinitrotoluene (2,4-DNT), a chemical used in certain explosives. The wasps can also be

used to detect chemical odors that are associated with certain human diseases, including lung cancer, skin cancer and stomach ulcers, they say. More recently, their group has been looking into the possibility of using the wasps to detect odors associated with hidden bodies, from murder victims to victims of disasters.

The other collaborator in this study was student Samuel L. Utley, M.S., currently a research engineer with the University of Georgia. The study was funded by the university and by the USDA. The researchers have filed a patent application for the Wasp Hound.

Source: American Chemical Society

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