> The Australian detector dog industry is described as “world class”

Dogs are Olympic sniffers. They have more than 220 million scent receptor cells (olfactory receptor neurons) compared to 5 million in humans[1]. The scent-processing section of the canine brain is larger, too.

This means dogs can detect some odours in parts per trillion. So, while you may notice your cup of tea has a teaspoon of sugar added to it, your dog can detect a teaspoon of sugar in two Olympic-sized pools worth of water. Also, when you smell a burger, your dog detects ground cow muscle, fat and gristle, cheese and the milk it’s made with, wheat bun (toasted), the sesame seeds, lettuce (hmmm, a day old), tomato sauce, spices, not to mention all the hands involved in making the food.

The sense of smell to dogs is what vision is to humans - it’s their memory system – and has helped make professional detector dogs invaluable in assisting humans in the field. Their speed, agility, trainability and acute sense of smell has allowed canines the ability to detect various cancers in humans, a drop in blood sugar in a diabetes patient or even an oncoming seizure in a person with epilepsy.

Dogs are also used to search for various plants and animals for conservation programs, plus termites, beetles, moths and other critters that can damage museum collections in a library. The canine nose also successfully detects narcotics, explosives and even blood samples at crime scenes or of missing people, such as after the infamous disappearance of Madeleine McCann from a holiday apartment in Portugal.

The Australian detector dog industry is described as “world class” in a press release by Peter Dutton, Minister for Home Affairs and Minister for Immigration and Border Protection, regarding the official opening of a new Australian Government Detector Dog Facility in Sydney earlier this year.

“This is another example of the Government’s commitment to bringing together the very best of Australia’s border and law enforcement agencies and fostering coordination and cooperation across departments and agencies,” said Mr Dutton.

Pet Industry News interviewed various experts in canine detection and learned we are just scratching the surface of canine olfactory abilities and itching for further research to explore their potential. The future of the detector dog industry is also shadowed by the lack of a national standard for detector dog programs (including breeding, training and/or program quality assurance) in the face of an emerging progressively inexpensive and effective electronic smelling technology.

Electronic noses have been ‘in the works’ since the 1980s, trying to mimic the olfactory system and eliminate operator fatigue. International researchers have made several attempts to replicate or improve the dog’s ability using artificial intelligence, but none designed to date have been able to match the canine’s capabilities.

Massachusetts Institute of Technology (USA) researchers engineered a tiny gas-sensing ‘electronic nose’ that could be used to detect hazards including carbon monoxide, harmful industrial solvents and explosives. Neuroscientists at USA’s Tufts University pioneered a next-generation artificial nose which uses DNA to detect millions — possibly billions — of odours. The ScenTraK can have many applications from finding contaminants in food supplies to uncovering chemical weapons.

Scottish researchers also developed a new ‘sniffer machine’ resembling a body scanning portal which uses quantum cascade (QC) lasers to detect any trace vapours of explosive material emitted by a passenger, without them having to remove any article of clothing in the process.

Electronic sniffer technology may become so common that everyone can use it! Scientists at German’s Karlsruhe Institute of Technology developed a low-cost olfactory sensor, called Smelldect, that can be taught different scents and suited for mass production and everyday use.

The Australian detector dog industry, known for its world class detector dog programs, has also caught the scent of research by Duke University (USA), which has made the beginning steps toward an artificial ‘robot nose’ device that officers could use instead of dogs[2]. The heart of the system would be living odour receptors grown from mouse genes that respond to target odours, such as the smell of narcotics and explosives.

“The idea of an artificial nose has been present for a long time,” said Dr Hiroaki Matsunami, senior study author and professor of molecular genetics and microbiology at Duke. “The receptors were identified in the 1990s, but there are significant technical hurdles to produce all these receptors and monitor the activity so that we can use that in an artificial device.

E-noses that exist now use various chemical compounds to detect smells instead of receptor stem cells, but “those devices are not as good as a trained dog,” said Dr Matsuami. “The idea is that by using the actual, living receptors, maybe we can develop a device similar to animals. Nobody has achieved that yet, but this study is moving toward that goal.”

CRITICAL REVIEW OF DETECTOR DOGS IN AUSTRALIA

In Australia, a critical study co-authored by various experts, including Dr Paul McGreevy, Professor of Animal Behaviour and Animal Welfare Science at the University of Sydney, has been published reviewing the role, operation and future of detection dogs as analytical instrumentation becomes an increasingly more viable alternative.

Co-author Dr James Hayes, Research Fellow from the School of Civil and Environmental Engineering at the University of New South Wales (UNSW), said analytical instrumentation (AI) is interacting with dog detection more than being an alternative. In some instances, AI helps with establishing experimental boundaries as well as assisting in investigating dog detection abilities themselves, he said.

“Effective AI detection is often based on the fact that its application can be straightforward. A swab that is taken and placed for some on-the-spot