

Scents of achievement



Clever canines trained to sniff out cancer in other dogs

Researchers working with expert detection dog trainers and staff from a large multi-specialist veterinary referral centre and hospital for pets in the UK have published a new study showing that specially trained canines can identify the distinctive odour of bladder cancer in other dogs' urine.

The project team for the new study included researchers from the University of Bristol, staff from a charity called Medical Detection Dogs (MDD), a veterinary oncology lecturer from the Royal Veterinary College (RVC) in London and various specialists from Davies Veterinary Specialists in Hertfordshire.

One in four dogs will present with a benign or malignant tumour at some point during their lifetime, and 50% of canines over the age of 10 will go on to develop cancer. The risk increases with age, just as it does in human patients.

Canine urothelial carcinoma (UC) of the bladder (also known as transitional cell carcinoma) is the most common cancer in the canine urinary tract. The disease is aggressive and highly invasive and it's responsible for about two per cent of all reported canine malign neoplasms.

However, the disease can be tricky for small animal practitioners to

diagnose because it can resemble other more common urinary tract disorders such as bladder stones and urinary tract infections.

It's not a good idea for vets to take a urine sample from the patient using a needle (i.e. cystocentesis) because doing so may cause a tumour, if present, to seed. Opting for cytology of urine obtained via a sample from the pet collected by their owner is not considered to be best practice either because sediment or particles in such samples only show tumour cells in 30% of cases.

Unfortunately, the similarity between the symptoms of common urinary tract disorders and UC may lead vets to try and treat an infection when the pet might actually have something far more sinister. Sadly, by the time UC is diagnosed in a much-loved dog it is often at an advanced stage.

Histopathology of a tissue biopsy is therefore required for a definitive diagnosis of UC in canines; however, it's an invasive procedure for the pet, costly for the owner, and the wait for pathology results may lead to a delay in the patient starting the treatment they need.

But what if there was an additional way of getting a reliable result that was far easier on the pooch?



Marlow, a black Labrador, one of the dogs used in the study trained by Medical Detection Dogs Photo courtesy of Neil Pollock/MDD

Enter three very special detection dogs from the MDD charity with a proven track record of detecting bladder and prostate cancer in human patients: Kizzy, a chocolate Working Cocker Spaniel, Jobi, a black Cocker Spaniel, and Marlow, a black Labrador.

Using advanced training methods over a time period of 29 days, MDD staff taught Kizzy, Jobi and Marlow to approach and sniff a range of different canine urine samples attached to metal stands. The three dogs were then taught to show "indication behaviour" such as sit and stare only to the positive (cancerous) samples they identified and to ignore the others. Whenever they identified both positive and negative samples correctly, they were rewarded with food and ball play, along with a secondary reward of an audible clicker.

"When they do get diagnosed, the disease is often advanced, so there is great potential value in a new, early, cheap, rapid and non-invasive diagnostic test which could lead to opportunities for earlier intervention than is possible at present."

Claire Guest, the CEO, co-founder and chief scientific officer of MDD

The urine samples from healthy dogs were sourced from MDD dogs and the pets of staff and volunteers of the charity for the control samples in the study. The UC-positive urine samples and controls with non-malignant urinary tract diseases were obtained from the "leftovers" of clinical canine patients of Davies Veterinary Specialists.

In a double-blind trial, each of the participating detection dogs were tasked with sniffing 20 control samples (from either 13 or 14 other dogs), 10 UC-positive samples (from between five and seven other dogs), and their behavioural responses were recorded.

The researchers found that Kizzy, Jobi and Marlow could indeed quickly and non-invasively detect canine urothelial carcinoma (UC) of the bladder by its distinctive odour – with the dogs averaging an 80% success rate, ranging from 70-90%. The canine trio did even better when it came to correctly ignoring the control urine samples. In these instances, they averaged a score of 91.7%; a range of 85-95% specificity.

Dr Nicola Rooney, one of the co-authors of the research, is an associate professor in the Animal Welfare and Behaviour Group at Bristol Veterinary School and also works as a senior scientist for MDD.

In a recent press release about the new study published on the University of Bristol's website she said: "This study adds to the growing body of evidence which shows dogs are highly effective at detecting odours from changes linked to health in both humans and canines."

The primary author of the study, Dr Isabelle Desmas-Bazelle, worked



Jobi, one of the dogs used in the study trained by Medical Detection Dogs Photo courtesy of BexArts/MDD

as an oncology specialist at Davies Veterinary Specialists and led the research there. She is now a lecturer in oncology and co-head of oncology at the RVC.

"The dogs involved with the study demonstrated a sensitivity superior to cytology of a free catch sample and similar to the BRAF test," she said. "It suggests cancer cells have a unique odour pattern, possibly via secretion of volatile organic chemicals. This exciting research could lead to the development of an electronic nose as an additional diagnostic test for UC."

Claire Guest, the CEO, co-founder and chief scientific officer of MDD, also contributed to the study and was thrilled with the results and the implications for how it might benefit canine patients in the future.

"We have proven many times that dogs can detect cancer in human samples so were confident that they would also be able to smell it in those from other canines," she remarked. "We are delighted that they were so successful at finding the odour of bladder cancer as it is a difficult disease to diagnose using traditional methods and unpleasant and intrusive for canine patients."

"When they do get diagnosed, the disease is often advanced, so there is great potential value in a new, early, cheap, rapid and non-invasive diagnostic test which could lead to opportunities for earlier intervention than is possible at present."

"Dogs are way more than only man's best friend."

You can read more about this study in the peer-reviewed, open-access journal *Veterinary Oncology*. 🐾



Kizzy, one of the dogs used in the study trained by Medical Detection Dogs Photo courtesy of Mark Large/MDD



Dr Isabelle Desmas-Bazelle led the research at Davies Veterinary Specialists and now works a lecturer in oncology and co-head of oncology at the RVC. Photo courtesy of Dr Isabelle Desmas-Bazelle



Dr Nicola Rooney, one of the co-authors who worked on the research, with her own dog Freddie. Photo courtesy of Dr Nicola Rooney