

## PROSTATE CANCER

## Sniffing out prostate cancer

Highly trained dogs' olfactory systems are capable of detecting prostate cancer by recognizing specific volatile organic compounds (VOCs) in urine samples from patients with the disease, according to a recent paper published in *The Journal of Urology*.

Two female German Shepherd explosive detection dogs, aged 3 years, were rigorously trained to recognize VOCs specifically found in the urine of men with prostate cancer, using operant conditioning.

“...dogs are capable of detecting VOCs specific to prostate cancer...”

A total of 902 participants were recruited to the evaluation phase of the study. The control group ( $n = 540$ ) consisted of 50 healthy nonpregnant women; 72 women who had non-neoplastic, neurological or metabolic disorders or a variety of cancers; 60 healthy men aged 18–25 years with no family history of prostate cancer; 240 men aged >45 years with serum PSA <1 ng/ml or stable PSA <2.5 ng/ml and a diagnosis of urological and/or systemic disease; 40 men who had undergone transurethral resection of the prostate (TURP) for BPH and had PSA <2.5 ng/ml and 78 men with nonprostatic cancers.

The prostate cancer group ( $n = 362$ ) included 29 men with metastatic prostate cancer—who were receiving hormonal therapy for biochemical relapse—and 11 patients with other tumours as well as synchronous primary prostate cancer. 180 patients who had undergone radical prostatectomy, 120 men with PSA levels >2.5 ng/ml or abnormal digital rectal examination, and 22 patients with very-low-risk or low-risk prostate cancer who were on active surveillance, with or prostate cancer that was detected incidentally during TURP were also recruited to this group.

Urine was collected spontaneously from each participant; the urine samples from both groups were blinded and analysed by both dogs, and the sensitivity, specificity and positive and negative likelihood ratios (LR) of each dog's performance was assessed. The first dog achieved a sensitivity of 100%, a specificity of 98% (incorrectly identifying only 7 of 540 samples), a positive LR of 77.10 and a negative LR of 0.00. The second dog demonstrated 98.6% specificity, 97.6% sensitivity, a positive LR of 41.00 and a negative LR of 0.01. No relationship was observed between the dogs' ability to detect the presence of cancer and the clinical or pathological stage of the cancer, prostate volume or tumour volume. Therapies that patients were



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receiving did not seem to interfere with the results and the dogs were able correctly identify all patients with synchronous prostate cancer who also had other, nonprostatic, malignancies.

Previous investigations have reported heterogeneity in the performance of canines between and within studies investigating the ability of dogs to detect cancer. However, this report demonstrates that rigorously-trained dogs are capable of detecting VOCs specific to prostate cancer in the urine of patients with the disease, with high specificity and sensitivity. This method might have the potential to offer a noninvasive alternative to PSA sampling and prostate biopsy for detecting prostate cancer.

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