

Researchers develop urine test for bladder cancer

28 January 2019, by Christopher Vaughan



Maximilian Diehn and Ash Alizadeh. Credit: Mark Tuschman

Researchers at the School of Medicine have developed a highly sensitive urine test for diagnosing and monitoring bladder cancer.

The test involves looking for fragments of cancer DNA in urine samples. "This study describes a new diagnostic approach to bladder cancer focused on analysis of [urine samples](#)," said Maximilian Diehn, MD, Ph.D., associate professor of radiation oncology. "Urine is in direct contact with bladder tumors, which shed some of their DNA into it."

The findings were published online Dec. 21 in *Cancer Discovery*. Diehn shares senior authorship with Ash Alizadeh, MD, Ph.D., associate professor of medicine. Postdoctoral scholars Jonathan Dudley, MD, and Joseph Schroers-Martin, MD, are the lead authors.

Sixth most common cancer

Bladder cancer is the sixth most common cancer. More than 80,000 people are diagnosed with it every year in the United States. Currently, the most

accurate method of diagnosing bladder cancer is through cystoscopy, an invasive method to visualize the bladder and take tissue samples. Another method is to look for [cancer cells](#) in the urine via a cytology test. Although noninvasive, this approach has suboptimal sensitivity, Diehn said.

The research builds on earlier studies co-authored by Diehn and Alizadeh in which they showed that they could detect certain cancers by looking for DNA fragments of tumors circulating in the bloodstream using a method called CAPP-Seq, an abbreviation for cancer personalized profiling by deep sequencing. In the new study, the researchers modified molecular and bioinformatics aspects of this technique to apply to bladder cancer DNA fragments found in urine. They analyzed a total of 67 healthy adults and 118 patients with early stage bladder cancer who either had urine collected prior to treatment or during surveillance.

The researchers found that by testing for bladder cancer in urine, they could detect cancer in the early stages of development, when it can be treated more easily. Their approach correctly identified the presence of bladder cancer in 83 percent of patients with early stage bladder cancer, compared with only 14 percent for the clinically available [urine cytology](#) test.

One of the greatest benefits of the new approach may be its ability to detect the recurrence of bladder cancer after someone has been treated for the disease. "In our test samples, we were able to detect [bladder cancer](#) recurrence an average of 2.7 months earlier than could be done with cystoscopy," Alizadeh said. With the new approach, they detected almost all cases of recurrent [bladder cancer](#), nearly double the sensitivity of cystoscopy and cytology.

The researchers believe that the method of looking for cancer DNA in [body fluids](#) other than blood could be more widely applied. "It may eventually be

useful for testing saliva for oral cancer, cerebrospinal fluid for neurological cancers or sputum for lung [cancer](#)," Diehn said.

More information: Jonathan C. Dudley et al. Detection and surveillance of bladder cancer using urine tumor DNA, *Cancer Discovery* (2018). [DOI: 10.1158/2159-8290.CD-18-0825](#)

Provided by Stanford University Medical Center

APA citation: Researchers develop urine test for bladder cancer (2019, January 28) retrieved 22 November 2022 from <https://medicalxpress.com/news/2019-01-urine-bladder-cancer.html>

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