

Researchers develop blood test that accurately detects early stages of lung, breast cancer in humans

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Researchers at Kansas State University have developed a simple blood test that can accurately detect the beginning stages of cancer.

In less than an hour, the [test](#) can detect [breast cancer](#) and [non-small cell lung cancer](#)—the most common type of lung cancer—before symptoms like coughing and weight loss start. The researchers anticipate testing for the early stages of pancreatic cancer shortly.

The test was developed by Stefan Bossmann, professor of chemistry, and Deryl Troyer, professor of anatomy and physiology. Both are also researchers affiliated with Kansas State University's Johnson Cancer Research Center and the University of Kansas Cancer Center. Gary Gadbury, professor of statistics at Kansas State University, helped analyze the data from tests with lung and breast cancer patients. The results, data and analysis were recently submitted to the Kansas Bio Authority for accelerated testing.

"We see this as the first step into a new arena of investigation that could eventually lead to improved early detection of human cancers," Troyer said. "Right now the people who could benefit the most are those classified as at-risk for cancer, such as [heavy smokers](#) and people who have a family history of cancer. The idea is these at-risk groups could go to their physician's office quarterly or once a year, take an easy-to-do, noninvasive test, and be told early on whether cancer has possibly

developed."

The researchers say the test would be repeated a short time later. If cancer is confirmed, diagnostic imaging could begin that would otherwise not be routinely pursued.

According to the [American Cancer Society](#), an estimated 39,920 breast cancer deaths and 160,340 lung cancer deaths are expected in the U.S. in 2012.

With the exception of breast cancer, most [types of cancer](#) can be categorized in four stages based on [tumor growth](#) and the spread of [cancer cells](#) throughout the body. Breast and lung cancer are typically found and diagnosed in stage 2, the stage when people often begin exhibiting symptoms such as pain, fatigue and coughing. Numerous studies show that the earlier cancer is detected, the greater chance a person has against the disease.

"The problem, though, is that nobody knows they're in stage 1," Bossmann said. "There is often not a red flag to warn that something is wrong. Meanwhile, the person is losing critical time."

The test developed by Kansas State University's Bossmann and Troyer works by detecting increased enzyme activity in the body. Iron nanoparticles coated with amino acids and a dye are introduced to small amounts of blood or urine from a patient. The amino acids and dye interact with enzymes in the patient's urine or blood sample. Each type of cancer produces a specific enzyme pattern, or signature, that can be identified by doctors.

"These enzyme patterns can also help distinguish between cancer and an infection or other diseases that commonly occur in the human body," Bossmann said. "For example, a person who smokes a lot of cigars may

develop an inflammation in their lungs. That will drive up some of the markers in the test but not all of them. Doctors will be able to see whether there was too much smoke inhalation or if there is something more serious going on. False-positives are something that we really want to avoid."

Once the test is administered, comprehensive results—which include enzyme patterns—are produced in roughly 60 minutes.

Bossmann and Troyer have designed a second testing method that is anticipated to produce the same results in about five minutes. The team recently received \$305,000 in funding for this project from the National Science Foundation's Division of Chemical, Bioengineering, Environmental and Transport Systems.

In addition to early detection, researchers say the test can be tweaked to monitor cancer. For example, patients being treated with drugs can be observed for drug effectiveness. Similarly, doctors can use the dye in the test to determine if the entirety of a tumor has been successfully removed from a patient after surgery.

Researchers evaluated the test's accuracy on 32 separate participants in various stages of breast or lung cancer. Data was collected from 20 people with breast cancer—ranging in age from 36 to 81 years old—and 12 people with lung cancer—ranging in age from 27 to 63 years old.

Twelve people without cancer were also tested as a control group. This group ranged in age from 26 to 62 years old.

A blood sample from each participant was tested three times. Analysis of the data showed a 95 percent success rate in detecting cancer in participants, including those with breast cancer in stages 0 and 1 and those with [lung cancer](#) in stages 1 and 2.

Tests detecting for pancreatic [cancer](#) are anticipated to begin in October as part of Bossmann and Troyer's collaboration with Dr. Stephen Williamson at the University of Kansas Medical Center. Blood samples from triple-negative [breast cancer patients](#) will be tested this fall in collaboration with Dr. Priyanka Sharma, who is also at the University of Kansas Medical Center.

Provided by Kansas State University

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