A Blood Test FOR CANCER

Richard Brand and Dr. Dhruvajyoti Roy of Laboratory for Advanced Medicine discuss the company's blood test for early cancer detection.


Richard Brand


Dr. Dhruvajyoti Roy

Detecting cancer early is the key to defeating it. Laboratory for Advanced Medicine (LAM) is working to detect cancer in its infancy when treatment options have the best chance to be successful.

The company's platform technology, IvyGene, detects the presence of cancer in blood samples and gives quantifiable data about the disease. LAM's approach differs from genetic tests that are based on DNA mutations, which provide patients with information only about their propensity or likelihood for cancer.

LAM's platform is based on cell-free DNA (cfDNA) methylation detection. The company currently has two tests on the market, one of which is an aggregate test. "If a physician and a patient have a concern that patient may have a particular type of cancer, they can take this test to ascertain with high accuracy that either the patient has cancer or does not have cancer," says Richard Brand, chief financial officer, Laboratory for Advanced Medicine.

Circulating tumor DNA (ctDNA) is a fragment of DNA that is shed from a tumor and circulates in the bloodstream. This contains the DNA methylation pattern of the cancer cell from which it was shed. Methylation is an epigenetic mechanism. DNA within cells may be modified by the addition of a methyl group (-CH3) to certain sites within the genome. This type of DNA modification acts as a heritable but reversible marker of gene expression, called an epigenetic marker. Methylation at specific sites in DNA correlates with the presence of cancer. Normal cells and cancer cells can be differentiated by detecting which sites within the genome are methylated.

"We're looking for DNA strands in the blood that are methylated, and we know from science that our bodies have aberrantly methylated DNAs when a tumor is just beginning as well as throughout the life of a tumor," Mr. Brand says. "We can detect the percentage of methylated DNA strands in the blood compared with the percentage of DNA strands in the blood that are not methylated."

Other liquid biopsies detect circulating tumor DNAs, which mainly identify somatic mutations in cfDNA by sequencing.

"We analyze cfDNA methylation from liquid biopsy samples, and our test can consistently detect early stage of the disease by measuring the tumor-associated methylation changes that occur in specific regions of known genes," says Dhruvajyoti Roy, Ph.D., director of technology, Laboratory for Advanced Medicine.

LAM is using artificial intelligence and machine learning algorithms to identify specific DNA methylation markers, and the company has a large biobank of patient blood samples, which has allowed it to develop and validate a series of diagnostic tests. LAM has sequenced more than 100,000 patients' blood samples. These patients were clinically confirmed for positive/negative cancer at the time of blood draw.

LAM has scanned more than a million methylation positions (CpG islands) for correlation to clinically confirmed cancer. And the company has identified and patented primers/probes for thousands of CpG islands, which correlate to 23 different cancer types.

In March, LAM released results of a study showing IvyGene's ability to detect liver cancer with 95% sensitivity and 97.5% specificity, breast cancer with 89% sensitivity and 96% specificity, and colorectal cancer with 93% sensitivity and 100% specificity. Three blinded validation studies were performed to evaluate individual panels of DNA methylation markers developed for the detection of liver, breast, or colorectal cancers. By quantifying DNA methylation at the target sites, the cancer-specific markers were able to differentiate with high sensitivity and specificity subjects diagnosed with cancer from both healthy donors and subjects with benign diseases.

The company has several other tests in development using the IvyGene technology. In May, LAM announced positive results from a new study that evaluated a DNA methylation-based marker panel for early diagnosis of nasopharyngeal carcinoma (NPC). The results of the study show an overall sensitivity of 97% and a combined specificity of 100%, demonstrating the high analytical potential of the IvyGene test.

NPC is the third most prevalent malignancy among men in Southern China and the fourth most common cancer in Hong Kong, constituting one of the most prevalent malignancies among populations native to Southeast Asia, the Mediterranean Basin, and the Arctic.

"We plan to do additional validation of a large NPC population cohort with the objective of making an accurate test commercially available to the at-risk population," Dr. Roy says.

Since this specific cancer type is highly prevalent in Asia, LAM will first file for approval with the China Food and Drug Administration (CFDA). The company estimates that the test will be commercially available in the market in 2020.

The company also has completed a Phase I validation for breast and colorectal cancers. "We plan additional Phase II validation of a large cohort before commercial launch," Dr. Roy says. The company plans to file with the FDA for the colon and breast cancer tests later this year, with market availability in 2020.

LAM has already started clinical trials in China for IvyGene Liver, and in the United States the company recently began a clinical trial designed to assess the test, both alone and in combination with ultrasound, for the detection of hepatocellular carcinoma (HCC) within a population that is at high risk for the disease due to liver cirrhosis. Recently, LAM's blood-based liver cancer test has been granted breakthrough device designation by the U.S. FDA.

The company is also working on tests for lung, pancreatic, ovarian, and brain cancers. PV