An E-Nose Can Predict Who Will Respond to Lung Cancer Immunotherapy
The investigational machine has an 85% accuracy rate.

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Researchers have developed an electronic nose—a machine into which an individual breathes—that with an 85% accuracy rate can determine whether individuals with lung cancer will respond to immunotherapy.

Publishing their findings in the Annals of Oncology, a research team at the Netherlands Cancer Institute in Amsterdam developed a prototype device called the eNose and tested it on 143 people with advanced non-small-cell lung cancer (NSCLC) between March 2016 and February 2018. They wanted to know how well the device predicted whether participants would respond to PD-1 checkpoint inhibitor immunotherapies, such as Opdivo (nivolumab) or Keytruda (pembrolizumab).

"The introduction of immunotherapy has dramatically improved the treatment of advanced stage non-small-cell lung cancer, but unfortunately, it is only effective in a subset of patients, which was about 20% when we started the study," the study’s lead investigator, Michel van den Heuvel, MD, PhD, a professor of thoracic oncology at the Radboud University Medical Centre in Nijmegen, the Netherlands, said in a press release.

The current gold-standard test to predict outcomes with such treatments, called immunohistochemistry, involves an invasive procedure that tests tissue biopsy samples for the presence of the immune-regulating PD-1 protein, which is the target of Opdivo and Keytruda.

Lung cancer patients breathe into the eNose’s tube, which is connected to sensors that detect chemicals known as volatile organic compounds. About 1% of breath is made up of these compounds. The readings from the sensors are sent to an online server and analyzed in real time, a process that includes a correction for variations in the air surrounding the patients who use the machine. Machine-learning algorithms produce results within one minute, predicting whether an
individual will likely respond to lung cancer immunotherapy.

The study participants used the eNose two weeks prior to starting treatment with Opdivo or Keytruda. Three months later, the investigators used RECIST criteria to assess whether the participants were responding to the immunotherapy.

The eNose proved 85% accurate at predicting a response to treatment. The machine identified 24% of the study cohort as likely nonresponders.

Avoiding immunotherapy that will provide no benefit can allow individuals to escape potentially serious side effects, which occur in about 10% of patients, including inflammation of the lungs, liver and colon.

“We are convinced that this study merely scratches the surface,” said van den Heuvel. “It represents the first introduction of modern precision medicine, namely that molecular fingerprints can be easily obtained and quickly analyzed on the spot. We believe that analysis of exhaled breath is going to become an important diagnostic tool and will guide future treatment in oncology as well as in many other diseases.”

To read a press release about the study, click here.

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