

# Breath analysis offers non-invasive method to detect early lung cancer

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Researchers at the University of Louisville School of Medicine are using breath analysis to detect the presence of lung cancer. Preliminary data indicate that this promising noninvasive tool offers the sensitivity of PET scanning, and has almost twice the specificity of PET for distinguishing patients with benign lung disease from those with early stage cancer. Michael Bousamra II, MD, Associate Professor, Department of Cardiovascular and Thoracic Surgery, is presenting the results of the study at the AATS 2014 Conference on April 29, 2014.

A reliable, noninvasive diagnostic method imposes less physical and financial burden on [patients](#) who actually have no significant disease, while rapid and accurate diagnosis expedites treatment for patients who truly have lung cancer.

The team believes that while the [breath test](#) would not replace CT as a primary screening tool, it would be particularly helpful in conjunction with a positive CT scan result. "This [breath analysis](#) method presents the potential for a cheaper and more reliable diagnostic option for patients found to have bulky disease on a CT scan. If the breath analysis is negative, the patient may, in some instances, be followed with repeated exams without necessitating a biopsy. But a positive breath analysis would indicate that the patient may proceed to definitive biopsy, thus expediting treatment," says Dr. Bousamra.

Investigators used specially coated silicon microchips to collect breath samples from 88 healthy controls, 107 patients with lung cancer, 40

individuals with benign pulmonary disease, and 7 with metastatic lung cancer.

Previous work had pinpointed four specific substances, known as carbonyl compounds, in breath samples as "elevated cancer markers" (ECMs) that distinguish patients with lung cancer from those with benign disease. The carbonyl compounds found in the breath are thought to reflect chemical reactions occurring in malignant lung tumors. In this study, the authors compared the findings from the breath analyses to the results from PET scans.

The investigators found that the sensitivity and specificity of breath analysis depended upon how many of the ECMs were elevated. For example, having 3 or 4 ECMs was diagnostic of lung cancer in 95% of those with this result. The majority of patients with benign pulmonary disease had either 0 or 1 ECM, while those with Stage IV cancer were most likely to have 3 or 4. The number of ECMs could be used to differentiate benign disease from both early and advanced stage lung cancer. Interestingly, 3 of the 4 elevated markers returned to normal levels after cancer resection.

When it comes to differentiating early stage [lung cancer](#) from benign pulmonary disease, breath analysis and PET scanning had similar sensitivities (82.8% and 90.3%, respectively). However, breath analysis had a much higher specificity than PET (75% vs. 38.7%, respectively) for distinguishing benign disease, which means that it was much more accurate at identifying those who did not have cancer. This would be an important feature for patients with benign disease, since having a breath analysis rather than PET scan could mean avoiding an unnecessary invasive biopsy procedure later on.

**More information:** "Quantitative analysis of exhaled carbonyl compounds distinguishes benign from malignant pulmonary disease," by

Michael Bousamra II, MD, Erin Schumer, MS, MD, Mingxiao Li, PhD, Ralph J. Knipp, MS, Michael H. Nantz, PhD, Victor van Berkel, MD, PhD, and Xiao-An Fu, PhD. Presentation at the 94th AATS Annual Meeting. April 26-30, 2014. Toronto, ON, Canada, during the General Thoracic Surgery Session on April 29, 5:15 PM ET.

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