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Professor studies human breath for disease indicators

*By **Jeff Samoray**, OU Web Writer*

Oftentimes, when a patient is diagnosed with a deadly disease such as lung cancer or severe acute respiratory syndrome (SARS), it is too late to provide an effective treatment. But research by Oakland University Associate Professor of Chemistry John Seeley and his students is taking us one step closer toward the early detection of these illnesses.

Seeley has teamed with researchers at Kettering University and McLaren Regional Medical Center in Flint to collect and analyze human breath samples to see if certain chemical compounds identify conditions of disease. Seeley developed the methodology and created the instrument that analyzes the compounds. His research has been funded by the Oakland University Research Excellence Fund and the National Institute of Environmental Health Sciences.

"My background is more in atmospheric chemistry, but studying the compounds in breath is similar to studying the compounds in the atmosphere," Seeley said. "Prior to beginning my research, I attended a lecture in which a complicated technique for analyzing human breath was discussed. I wanted to improve upon this approach and decided to pursue this research."

Seeley's wife Stacey, a chemistry professor at Kettering, received a grant from the McLaren Center to study breath samples from osteoarthritis patients. Samples were collected from 40 participants, who each released a deep breath in an airtight plastic bag. Each sample then was run through a cartridge to collect concentrated organic compounds. The cartridges then were sent to OU for analysis.

"The breath itself contains very little information as to the health of the individual," Seeley said. "The cartridges contain thousands of organic compounds, which we need to quantify and isolate. Our goal is to be able to take the reams of data we collect and be able to pluck out the features that are the tell-tale signs of disease. My approach has been to develop a tool that can do this."

In a lab in OU's Science and Engineering Building, master's student in chemistry Nicole Primeau sits in front of a computer screen that displays small blotches and dots representing compounds from a breath sample. Eventually, Seeley's research may lead to a simple, non-invasive means of detecting disease in humans, but it's likely that reaching such a method will take years of research and further methodology refinement.

"The level of complexity is quite high," Primeau said. "Advances in computer science help, but the instrument we're using is unable to handle the thousands of compounds that can be detected."

"It's like looking into the night sky and asking how many stars you can see," Seeley said. "The answer is: it depends on how deep you look."

Seeley, a 2003 OU Teaching Excellence Award winner, joined the OU faculty in 1997. He completed a Ph.D. in atmospheric chemistry at the Massachusetts Institute of Technology in 1994 and served as a postdoctoral fellow at MIT until 1995, working in the laboratory of Nobel Laureate in Chemistry Mario Molina. Seeley also served as a postdoctoral fellow at the Air Force Research Laboratory from 1995 to 1997.

In his career at Oakland, Seeley has established an international reputation for research contributions that have helped improve a fundamental aspect of separation science. He was invited to deliver the keynote presentation at the International Symposium on Comprehensive Two-Dimensional Chromotography in Volendam, the Netherlands, in March 2003, demonstrating the impact of his work on the field. Seeley's discoveries have been published in top-tier journals and are used in numerous environmental and biomedical applications. The importance of his work is recognized with significant extramural research support from the National Science Foundation and other major sponsors.

For more information on Seeley, his research interests and recent publications, visit OU's **Department of Chemistry** Web site.

SUMMARY
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