

Sniffing out lung cancer at early stages

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New animal research from scientists at the Monell Center and collaborators demonstrates that body fluid odors can be used to identify animals with lung cancer tumors. The findings set the stage for studies to identify potential diagnostic biomarkers in the urine of human lung cancer patients.

Lung cancer is the leading cause of cancer-related deaths worldwide, responsible for 1.3 million deaths annually. Effective techniques for early diagnosis are urgently needed, as the disease often has no early signs or symptoms.

"Cancer tumors result in a change in body-related odors that can be detected both by trained animal sensors and by sophisticated chemical techniques," said Monell biologist Gary K. Beauchamp, Ph.D., a senior author on the study. "These findings indicate that odor sensing has the potential to improve early diagnostic and prognostic approaches to lung cancer treatment."

Anecdotal reports have suggested that odor changes might be used to identify individuals affected with cancer, but experimental work in this area has not been conclusive. The current study, reported in the online journal [PLoS One](#), used a rigorously controlled animal model to eliminate many confounding factors frequently found in human patient studies.

In behavioral studies, sensor mice were first trained to recognize the scent of urine from animals bearing lung cancer tumors. The trained

sensor mice were then able to use urine odor to distinguish tumor-bearing from healthy animals.

Chemical analyses of urine compounds revealed that the amounts of several chemical compounds differed dramatically between tumor-bearing and healthy mice. Surprisingly, the levels of many of these compounds were decreased in tumor-bearing mice rather than increased, which is what often is expected.

In subsequent experiments, the researchers were able to identify tumor-bearing from control mice simply by measuring the amounts of these biomarker chemicals in mouse urine and then constructing chemical profiles. This chemical classification was sensitive enough to accurately identify 47 out of 50 mice as tumor-bearing or healthy.

The findings indicate that lung cancers produce changes in odorous compounds secreted in urine and that these changes can be detected and used as a diagnostic tool.

"Finding new ways to screen for early lung cancers in patients at risk, such as smokers, is one of the best ways we have to reduce the high death rate from this disease," said Steven M. Albelda, M.D., William Maul Measey Professor of Medicine, University of Pennsylvania School of Medicine, also a senior author on the paper. "Using the same chemical approaches as in this paper, we hope to be able to detect odors in [urine](#) of smokers that could be used to identify [lung cancer](#) at a very early stage."

Provided by Monell Chemical Senses Center

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