Cancer Prevention & Research Institute of Texas

Award ID:
RP170747

Project Title:
Noninvasive Lung Cancer Screening by Rapid Chemical Profiling of Exhaled Breath

Award Mechanism:
High Impact/High Risk

Principal Investigator:
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Entity:
The University of Texas at Arlington

Lay Summary:

Lung cancer is a major public health problem in the State of Texas and the United States. Lack of effective methods of screening and early detection, lung cancer is frequently diagnosed at an advanced stage, which leads to high mortality rate, accounting for approximately 27 percent of all cancer deaths. Currently, the screening and diagnostics of lung cancer are heavily relying on chest X-ray, low-dose computed tomography (LDCT), and followed by evaluation of biopsy tissue taken from suspicious lesions. Unfortunately, chest X-ray has poor sensitivity and selectivity. Although LDCT provides improved imaging quality, it has the drawback of radiation exposure. More importantly, a large percentage of lung nodules detected by LDCT scan is benign tumor instead of early stage cancer. Further evaluation of suspicious lung nodules require multiple rounds of further imaging or biopsy, which is costly, invasive, time-consuming, and impractical for routine cancer screening. Therefore, there is a pressing need in search for alternative technologies to effectively screen and diagnose lung cancer at an earlier stage, which are accurate, non-invasive, cost-effective, sensitive, and have short turn-around analysis time. We propose to develop a novel non-invasive technology for rapid analysis of chemical compounds from human exhaled breath as a novel method for lung cancer screening and potential diagnosis. It is well known that human exhaled breath contains hundreds of volatile organic compounds (VOCs) that reflect the human health conditions. Detection of those VOCs provides an easy and non-invasive means to diagnose and monitor patients' diseases. This project will develop a portable gas analysis point-of-care device to rapidly analyze and detect VOCs with parts-per-billion (ppb) sensitivity in real-time. If successful, the proposed technology will have high-impact to lung cancer early detection, management, assessment of treatment effectiveness, and cancer prognosis.