

QUANTUM TECHNOLOGIES, METAMATERIALS, AND THE FUTURE OF CB SENSING

Respiratory Infection Single Exhale (RISE) Breath Test

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The DoD seeks to develop a new compact breath sensor for wide distribution, far-forward non-invasive monitoring, and immediate detection of infected individuals. The solution proposed by our team at The Ohio State University involves the development and validation of a Respiratory Infection Single Exhale (RISE) Breath Test. RISE is a Point of Care (PoC) device. Previous work on respiratory viral infections demonstrated that airway inflammation results in the release of volatile organic compounds as well as nitric oxide. The detection of these gases from patients' exhaled breath offers a novel potential diagnostic target for respiratory diseases. Our research aims to identify distinct breath prints for the infections tested in a typical Respiratory Pathogens (RP) panel, including viral infections: the flu, common cold, Respiratory Syncytial Virus (RSV), adenovirus infections (pneumonia; croup), COVID-19; and bacterial infections, such as whooping cough and bacterial pneumonia. Our previous work on COVID-19 has utilized gas-selective sensors which allowed for the temporal manifestation of the interactions of gaseous biomarkers of infection with the sensors, thus giving a distinct breath print of the COVID-19 disease. We have developed and have been testing the 4-sensor RISE device in patients screened for multiple agents: 15 viral and 5 bacterial. The goal is to develop a robust detection pattern for at least two common viral pathogens and three common bacterial pathogens. We target these five initial pathogens based on their virulence and prevalence in community. We will be presenting RISE test's diagnostic specificity, as well as its repeatability and reproducibility, long-term stability, and lifetime of the device. We will also be discussing the breath test's Diagnostic Specificity (True Negative / True Negative + False Positive) and Sensitivity (True Positive/True Positive + False Negative). The RISE test is expected to have the ability to discriminate between and within the different types of respiratory infections (viral vs bacterial); and to detect a respiratory disease up to 3 days before symptoms of the disease appear. Accuracy close to commercially available PCR-based Respiratory Viral Panel (RVP) tests at a fraction of the turnaround time and cost is the proposed benefit from this work which is being supported by DTRA/DIU (contract no. HQ0034-23-9-0020; titled Exhaled Breath Diagnostics).

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