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Advancing the Arizona State University Knowledge Enterprise

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Device for Monitoring Biological Volatiles Across Time

-Volatile organic compounds (VOC) from different cell sources (cultured, animal or human) provide a wealth of untapped information regarding metabolic processes. They hold great potential for use as biomarkers for early non-invasive monitoring of cancer, infection and organ damage or failure. There are currently no technologies for optimal and reproducible VOC measurements from tissue or living organisms; existing approaches damage or destroy tissue/cells or organisms, limiting follow-up use of the sample.

Researchers at Arizona State University have designed a unique controlled environment system for continuous and extended detection of VOCs due to biological, chemical, environmental and mechanistic alterations in the sample. This technology enables VOC monitoring across time, produced from tissue or other living systems. Its unique geometry/ design is readily scalable and can also be coupled with other in vitro experiments to find utility in both clinical and research applications.

This system of continuous and extended period of measuring VOC has the potential to be used for detection of early biomarker in biological models of cancer, particularly lung cancer, lung infections, microbiological models and breath analyses.

Potential Applications

- Measuring changes as a result of chemical, environmental and mechanistic changes in the sample
- Multiplexing with other in vitro experiments for analyzing deep biological concepts
- Early biomarker detection for diagnosis and prognosis of cancer, infectious diseases and organ failure
- Incorporation into disease models, breath analyses and microbiological models

Benefits and Advantages

- VOC detection can be performed in a continuous manner for an extended period of time
- Readily scalable for multiplexed experiments
- Geometry allows for laminar flow of air with minimal VOC loss
- Integration of existing GC techniques facilitates rapid research and clinical adoption
- Allows for dual imaging capability that facilitate pairing VOC measurement with visual reporters capable of deep biological exploration
- Minimizes background/contaminant volatiles
- Can be combined with existing gas chromatography mass spectrometry instrumentation
- Controlled environment (temperature, oxygen, CO2) helps promote survival/growth
- Input gas can be controlled to test other conditions (hypoxia, hyperoxia, etc.)

For more information about the inventor(s) and their research, please see

Dr. Smith's departmental webpage