Contribution ID: **321** Type: **Oral presentation**

Towards Real-Time Detection of COVID-19 via Untargeted Volatile Organic Compound Profiling Using Online Gas Chromatography-Ion Mobility Spectrometry

Wednesday, October 15, 2025 10:40 AM (15 minutes)

Volatile organic compounds in exhaled breath reflect metabolic alterations during viral infection, offering potential for rapid SARS-CoV-2 detection. We developed an online gas chromatography-ion mobility spectrometry (GC-IMS) method for direct breath analysis from 119 participants with RT-PCR confirmed COVID-19 status. Participants breathed directly into the GC-IMS instrument (STEP, Pockau, Germany) through a mouthpiece for 4 seconds, followed by 209 seconds analysis. The system utilizes a 20-meter MXT-5 GC column (at 60℃) with tritium IMS detector operating at 400 V/cm. Measurements at ambient conditions use filtered air as drift gas. Ambient air samples enable background subtraction reducing environmental confounding. The platform achieves ppb-ppt detection limits with a computational pipeline for spectral processing and analysis. Comprehensive metadata including dietary intake accounts for confounding factors. This untargeted approach aims to classify COVID-19 patients using machine learning on breath VOC profiles. Previous experimentation distinguished antibiotic-resistant bacteria with similar instrumentation (MCC-IMS) in in vitro tests. The method provides rapid (< 4 minutes), non-invasive screening with real-time results, offering potential for point-of-care diagnostics and high-throughput pandemic applications.

Keywords

COVID-19, Breath analysis, VOCs, Non-Invasive Diagnostics, Point-of-Care-Diagnostics, metabolomics,GC-IMS

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Professional Status of the Speaker

Graduate Student

Junior Scientist Status

No, I am not a Junior Scientist.

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