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*8th
meeting on
medicinal
biotechnology*

BOOK OF
ABSTRACTS

MAY 29TH, 2026
SCHOOL OF HEALTH
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BOOK OF ABSTRACTS OF THE 8TH MEETING ON MEDICINAL BIOTECHNOLOGY

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Profiling airway microbiome composition through volatilomics

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The airway microbiome is known to mediate respiratory health. However, current available methods for microbiome analysis are time-consuming and/or represent significant costs for a generalized application in clinical practice. Volatilomics has been suggested as a rapid and low-cost approach to screen microbial profiles in human samples. Therefore, we aimed to study the efficacy of volatilomics in discriminating microbial isolates collected from human breath condensate samples. Bacterial strains showing significant growth under conditions simulating the respiratory environment were isolated. Each strain was standardised to an inoculum of 10⁸ CFU/mL and analysed using an electronic nose equipped with a six-sensor matrix. Data were explored through principal component analysis, cluster analysis, pattern analysis, random forests and recursive partitioning regression. One sensor was removed from the analysis due to high collinearity. Principal component analysis was able to separate strains and the control mainly through the second principal component ($p = 0.024$), characterized by high MQ3 and MQ8 sensor responses. Sensor profile maps showed distinct volatile patterns across strains (Figure 1), suggesting the presence of distinct microbial signatures. However, reproducibility was low between

replicas and time since culture. Recursive partitioning for separating sterile controls from inoculated samples showed the highest accuracy (AUC = 0.73). These results show the potential of separation of microbial strains based on volatilomics. Nonetheless, relative robustness was only achieved for the discrimination of sterile vs inoculated samples.

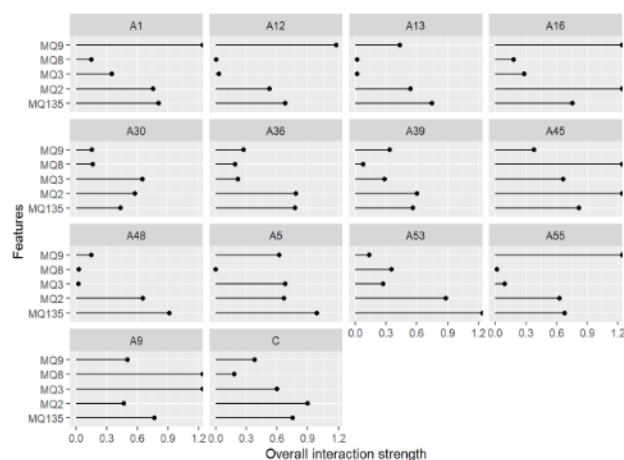


Figure 1 – Sensor profiles for the identified strains (A1 to A55) and controls (C).

KEYWORDS: *electronic nose, metabolomics, microbiome, volatile organic compounds*

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