Rapid diagnosis of tuberculosis through volatile molecule analysis

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Tuberculosis is a major public health concern; the active disease affects as many as 23 million people worldwide and is rapidly evolving resistance to antibiotic treatment. One of the major tuberculosis healthcare challenges is to provide a fast and effective diagnosis. Present clinical methods often take as long as two months to determine a positive or negative result, relying extensively on cultivation of the causative agent (the bacillus *Mycobacterium tuberculosis*) from patient sputum. This study explores the utility of secondary electrospray ionization mass spectrometry (SESI-MS) analysis of volatile organic compounds (VOCs) in the breath as a rapid diagnostic tool for tuberculosis. We hypothesize that respiratory infections generate a distinctive pattern of volatiles in the host's breath, and that once identified, these patterns can serve as diagnostic signatures. In this exploratory study, we generated a database from the existing literature of known volatiles associated with tuberculosis infection (from bacteria grown in culture to human breath studies). We then prepared for the evaluation of volatiles from cultures of tuberculosis by assessing volatile chemical stability in Tedlar sampling bags. Currently, we are working with collaborators at the Trudeau institute to identify and quantify the headspace volatiles of culture-grown *Mycobacteria* (including *M. tuberculosis*) as a first step toward characterizing the breath volatile profile of infected mice as well as humans for a diagnostic signature for this important human pathogen.