Volatile markers of pulmonary tuberculosis in the breath
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Background: Mycobacteria excrete volatile organic compounds (VOCs) as metabolites. We examined human breath VOCs for markers of active pulmonary tuberculosis infection. **Methods: In vitro:** We captured head space VOCs in M. tuberculosis cultures on sorbent traps for analysis by gas chromatography/mass spectroscopy (GC/MS). **Human:** We studied 40 adults in hospital to rule out pulmonary tuberculosis and 27 healthy controls. A breath collection apparatus captured alveolar breath VOCs on sorbent traps for analysis by GC/MS. **Data analysis:** We used pattern recognition analysis (SIMCA, soft independent modeling of class analogies) to correlate sputum culture results with breath VOCs, either metabolites of M. tuberculosis or markers of oxidative stress (C4-C20 alkanes and monomethylated alkanes). **Results:** M. tuberculosis cultures yielded 130 different VOCs, mainly benzene derivatives, alkanes and methylated alkanes. Sputum cultures for M. tuberculosis were 18/40 positive, 16/40 negative, 6/40 pending. SIMCA identified culture positive patients using oxidative stress markers in breath (94.1% sensitivity, 95.1% specificity). **Conclusions:** These findings are consistent with previous reports of increased oxidative stress in patients with active pulmonary tuberculosis. Pattern recognition analysis of breath VOCs may provide a new method for rapid, accurate and non-invasive detection of active pulmonary tuberculosis.