

Volatile markers of pulmonary tuberculosis in the breath

M. Phillips, R. N. Cataneo, R. Condos, G. A. Ring Erickson, J. Greenberg, V. La Bombardi (Fort Lee, Valhalla, New York, Woodinville, United States Of America)

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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.