

Towards a metabolomic approach to respiratory disease in childhood: Feasibility and acceptability of a novel breath-sampling procedure and initial breath analysis data

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Introduction and Objectives

Asthma diagnosis and treatment is based mainly on presence of symptoms and response to treatment. This carries the risk of misdiagnosis and under- or overtreatment. The focus in asthma management has shifted to the underlying chronic airway inflammation. We are developing a novel approach in which breath samples are analysed for volatile organic compounds (VOCs) that alone or in combination may be used as biomarkers for airway inflammation. The aims of the current study are (1) to determine the feasibility and acceptability of the sampling procedures for children aged 8-16 years, and (2) to collect preliminary data on potential candidate markers.

Methods

Children were recruited from Asthma clinics, or in response to posters in the hospital (controls). Nitric oxide and spirometry measurements were made and clinical metadata recorded. Exhaled breath was collected onto an adsorbent VOC sampling tube using a face mask supplied with purified medical-air under computer control to enhance reproducibility. [1] Breath samples were collected with the child in a relaxed state watching TV. No specific breathing manoeuvres were required. Three attempts to collect breath from each child were made (5-8 minutes per sample). The child completed a feedback form on the procedure, based on a Likert scale. Breath samples were analysed by thermal desorption – gas chromatography – mass spectrometry/differential mobility spectrometry.

Results

At the time of abstract submission seven children aged 9 to 14 (5 with asthma) had participated. All were able to provide three samples and feedback showed that they were all “willing to undertake this test again if asked to do so.” One participant reported slight discomfort while wearing the face mask. The gas chromatograph-mass spectrometer data (Fig) that allow the relative concentrations of the different volatile components of exhaled breath to be estimated were comparable to data previously obtained in adults.

Conclusions

The sampling procedure is entirely acceptable to children. Larger numbers of children should reveal whether this new metabolomic approach to asthma, coupled with advanced statistical approaches, is likely to provide molecular biomarkers useful for non-invasive diagnosis and management.

1. Basanta M, et al. *Analyst*. 2007(132):153

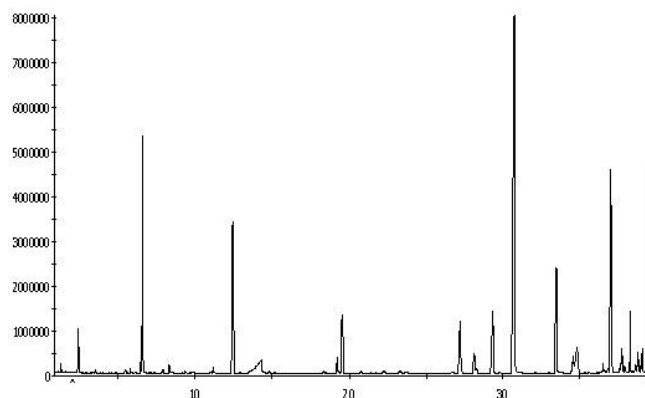


Figure: GC-MS trace of exhaled breath of asymptomatic 11 year old boy. Separation of molecular species in breath in retention time (min) x-axis, against the level of the compound (counts) y-axis.