Efficacy of high-altitude climate therapy in asthmatic children

The reduction of airway inflammation is essential for good asthmatic control. Reliable and non-invasive measures of airway inflammation are important, especially in childhood, and these measures should be specific, sensitive, repeatable, simple and non-expensive. The aim of this study was to evaluate the clinical potential for the assessment and monitoring of airway inflammation by measuring nitrates in breath condensate before and at the end of high-altitude climate therapy in asthmatic children.

Aims and methods
A total of 48 asthmatic children (23 females; aged 4–14 yrs, mean 8.6 yrs) on regular anti-asthma treatment with a normal forced expiratory volume in one second (FEV1) (>80% predicted) and a positive skin-prick test (SPT) for house dust mites were recruited. All were referred to the Alpine Allergy Clinic in Davos, Switzerland (1,570 m above sea level), and all were treated with inhaled steroids plus long-acting bronchodilators or anti-leukotrienes (28 and 11 patients, respectively). Despite the treatment and a normal FEV1, most of the children suffered recurrent episodes of cough, wheezing and/or dyspnoea. Spirometry, bronchial provocation tests and breath condensate nitrites were assessed on their arrival and before departure from the alpine clinic.

Results
Median levels of nitrites were significantly higher before than after high-altitude therapy (1.27 versus 0.93 mM; p=0.008), and mid-expiratory flow (MEF50) improved significantly (p<0.0005). A significant correlation was found between nitrites in breath condensate and MEF50 (r=0.63, p<0.0001), symptoms (r=0.47, p=0.0007) and airway hyperreactivity (r=0.41, p=0.004).

Conclusions
Breath condensate nitrites correlated well with clinical symptoms, MEF50 and airway hyperreactivity in asthmatic children. Living at high altitude could represent a good opportunity to improve asthmatic children’s health.

Editorial comments
The control of airway inflammation is the key goal in asthma treatment, and it is important to have reliable and non-invasive measures that are specific, sensitive, repeatable, simple and non-expensive. Bronchial biopsies and bronchoalveolar lavage are specific and sensitive but too invasive, and induced sputum cannot easily be collected from children. The measurement of inflammatory markers in the exhaled air has gained increasing interest; exhaled nitric oxide (eNO) is the most studied of these markers. Other parameters that could be measured in the condensate of exhaled air include hydrogen peroxide, carbon monoxide, leukotrienes, nitrosothiols and nitrites. In a previous study, the same authors have demonstrated that nitrites in breath condensate are higher in children with asthma and cystic fibrosis when compared with healthy children. Even if there are some questions regarding the method of measurement of nitrites in breath condensate (the procedure for collecting is to be standardised, especially regard collection time and flow dependence), high ambient NO could influence nitrites, these results are important in order to detect ongoing inflammation in children with persistent symptoms, even if they have normal FEV1.

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