Olin et al. Clinical and Translational Allergy 2013, 3(Suppl 1):P12
http://www.ctajournal.com/content/3/S1/P12

Clinical and Translational Allergy

POSTER PRESENTATION Open Access

Bronchodilatation increases number of particles in exhaled air in subjects with asthma

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From EAACI International Severe Asthma Forum (ISAF 2012)
Gothenburg, Sweden. 11-13 October 2012

Background

Particles in exhaled air (PEx) are derived from the small airways and are formed during airway closure and re-opening. They mainly contain surfactant; both phospholipid and protein composition in PEx resemble that of BAL. Measurements of surfactant protein A in PEx from 100 l exhaled air were shown to be highly reproducible, making the PEx a promising tool in the monitoring of asthma. The number of exhaled particles varies substantially, mainly among subjects, but also within subjects. To enable a correct interpretation of the results using PEx it is crucial to examine how airway constriction affects the number of exhaled particles.

Aim

To examine the effect of bronchodilatation on exhaled PEx concentration.

Method

16 subjects with pollen-asthma and 14 healthy non-atopic subjects (all non-smokers) were examined before and after bronchodilation during the pollen season and outside the pollen-season. PEx, spirometry, blood-samples and answers to a questionnaire were obtained. The subjects performed a breathing maneuvers allowing for airway closure and re-opening and PEx concentrations in about 60 l of exhaled air were measured with an in-house developed instrument based on particle impaction.

Results

PEx concentrations were not significantly different between asthmatics and controls but asthmatics showed lower PEx concentrations during pollen season compared to outside pollen season (3.46 v s 4.32 p=0.01) whereas controls showed non-significant differences between seasons (6.86 v s 4.54 p=0.15). PEx concentrations increased after bronchodilatation in asthmatics (median 4.05*103 to 4.92*103, p=0.02), but not in controls (median 4.47*103 v s 4.50*103 p=0.12). The change in PEx concentration (%) was associated with the change in FVC (%) (rp= 0.51, p=0.001) and FEV1 (rp= 0.46, p=0.003) among subjects with asthma whereas there were no significant correlations among controls.

Conclusion

In the present study the subjects had mild symptoms and rather low reversibility also during pollen-season. Nevertheless, PEx concentrations were apparently influenced by bronchomotor tone and increased after bronchodilatation, presumably reflecting increased airway opening following bronchodilatation in asthmatics with ongoing airway inflammation.

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Published: 3 May 2013

doi:10.1186/2045-7022-3-S1-P12
Cite this article as: Olin *et al.*: Bronchodilatation increases number of particles in exhaled air in subjects with asthma. *Clinical and Translational Allergy* 2013 **3**(Suppl 1):P12.

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