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Serum Chitotriosidase Levels in Patients with Allergic and Non-Allergic Asthma*E. Bargagli^a, C. Olivieri^a, M. Margollicci^b, D. Bennett^a, A. Luddi^b, M. Perrone^a, C. Maggiorelli^a, A. Prasse^c, P. Rottoli^a*^aSezione di Malattie Respiratorie, Dipartimento di Medicina Clinica e Scienze Immunologiche, and ^bSezione di Pediatria, Università degli Studi di Siena, Siena, Italy; ^cDepartment of Pneumology, Freiburg University, Freiburg, Germany

Asthma is a complex inflammatory disorder of the airways characterized by bronchial hyper-reactivity to different stimuli, and its pathogenesis is not always completely clear. Chitinases and chitinase-like proteins have recently been proposed as molecules involved in the pathogenesis of asthma with a possible role as prognostic biomarkers [1–6].

Higher serum concentrations of YKL-40 (chitinase-3-like-1), a 'mammalian chitinase-like protein', have been reported [2, 4, 5] in asthma patients and hyper-responsive subjects than in controls. The YKL-40 gene has been associated with genetic susceptibility to the disease. Acid mammalian chitinase (AMCase) has been studied in animal models of airway inflammation [3] and AMCase gene expression has been investigated in detail in BAL fluid macrophages and epithelial brushing from asthma patients [1, 5].

Another member of the chitinase 1 family not yet studied in detail in asthma is chitotriosidase, an enzyme produced by activated macrophages, structurally similar to YKL-40 but having chitinolytic activity [7, 8]. In the last 5 years our research group has investigated the role of chitotriosidase in the pathogenesis of different inflammatory lung diseases, such as sarcoidosis [9]. Here we analyzed serum concentrations of chitotriosidase in allergic and non-allergic asthma patients and in a group of controls to evaluate its potential involvement in the different pathways of inflammation occurring in this disease.

Chitotriosidase concentrations were measured in serum samples from 23 patients with allergic asthma, 19 non-allergic asthmatics and 35 healthy controls by a fluorimetric method (Sigma, St. Louis, Mo., USA). Selected patients with PC20 methacholine less than 8 mg/ml were followed at our centre for almost 5 years. They were divided into allergic and non-allergic groups according to medical history, prick test and RAST test results. All patients performed lung function tests, chest X-ray and total IgE analysis at the time of serum sampling. Statistical analysis was performed using Windows software (2005) Graph Pad Prism version 4.0.

Fig. 1. Chitotriosidase concentrations in patients with allergic asthma (group 1), non-allergic asthma (group 2) and in controls (group 3).

Since the data did not have a normal distribution (Shapiro-Wilk's test), statistical differences were detected by the Kruskal-Wallis test ($p < 0.05$).

Serum concentrations of chitotriosidase were 48.72 ± 31 nmol/h/ml in allergic asthmatics, 51.5 ± 29 nmol/h/ml in non-allergic asthmatics and 21.42 ± 11 nmol/h/ml in controls (fig. 1). Significant differences were found between the concentrations of chitotriosidase in asthmatics and controls ($p < 0.05$). Concentrations of chitotriosidase greater than normal values were observed in 60% of allergic and 63% of non-allergic asthmatics. No significant differences were found between chitotriosidase concentrations in allergic and non-allergic patients, although the highest concentrations of chitotriosidase were found in 4 patients with documented allergy to dust and moulds.

Tercelj et al. [8] studied serum chitotriosidase activity in various lung diseases, finding concentrations of chitotriosidase in a small population of asthmatics similar to ours. Unfortunately this study did not divide patients according to their history of allergy or specify whether any groups of patients had higher chitotriosidase concentrations.

In conclusion, though preliminary, this data suggests that chitotriosidase is much more enhanced in serum of asthma patients than controls. Further studies focusing on specific subgroups of patients (e.g. subjects allergic to mites and mould) in whom enzyme concentrations are very high could also be performed to investigate whether chitinolytic activity is mainly enhanced in specific categories of allergies.

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