

House dust mite-induced histamine release from washed blood cells

Evaluation of effect parameters

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In a selected group of 60 house dust mite allergic asthmatics, the correlation between the bronchial sensitivity to house dust mite and effect parameters of mite-induced histamine release from washed blood cells was evaluated. Using a sensitive glass microfibre-based method, a significant positive correlation ($r = 0.60$; $P < 0.001$) was found between bronchial allergen sensitivity and basophil cell sensitivity expressed as the house dust mite concentration necessary to give half the maximum histamine release. No correlation was found between bronchial sensitivity and other parameters of the histamine release response. This way of determining the histamine release from washed blood cells is a simple and valuable alternative to bronchial allergen challenge.

Key words: bronchial challenge; *Dermatophagoides pteronyssinus*; histamine release.

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Bronchial provocations with relevant allergens are valuable when evaluating the severity of allergen-specific type I allergic reactions in asthmatics. However, the procedure has some limitations: 1) it is time-consuming, 2) testing is not possible or reliable when lung function is low or during treatment with bronchodilators, 3) the procedure is inconvenient to the patient, especially if late reactions occur. In general, such drawbacks are not associated with *in vitro* diagnostic procedures. Among these the assay employing allergen-induced histamine release from human basophils fulfils the demands of specificity and sensitivity in diagnosing type I allergic reactions (1, 2, 4, 7). Recently, a new simple method for measuring histamine release from washed blood cells has been developed (8). A comparison of this method and the bronchial provocation test showed good agreement with respect to positive and negative responses (6). It was therefore of interest to examine more closely the possible correlation between the degree of sen-

sitivity to a specific allergen in the lungs and the basophils.

From allergen-induced histamine release different parameters could be obtained: 1) the allergen concentration giving half maximum histamine release (i.e. cell sensitivity), 2) the allergen concentration giving maximum release (i.e. cell reactivity), and 3) the maximum amount of histamine released per blood volume. In the present study these three effect parameters of histamine release were compared with the bronchial allergen challenge in a selected group of house dust mite allergic asthmatics.

MATERIAL AND METHODS

Based on clinical history, reactivity in skin prick test and demonstration of allergen-specific IgE, 60 adult asthmatics were selected as potential candidates for hyposensitization with extract from the house dust mite *Dermatophagoides pteronyssinus*. The patients were exposed to various

tests including bronchial challenge with *Derma-tophagoides pteronyssinus* antigens and measurement of histamine release from washed blood cells. The bronchial challenge was performed as described (3) and results were expressed as the allergen concentration giving $\geq 10\%$ decrease in the forced expiratory volume in the first second (FEV₁). Except for 32 patients who took inhaled steroid when challenged, no anti-asthmatic medication was allowed prior to the tests. Histamine release was performed by a new glassfibre method (8) and would either be expressed as the absolute amount of histamine released or as the antigen concentration giving rise to either the maximum release or to half of this value.

RESULTS

Statistically significant correlation could be demonstrated only between bronchial allergen sensitivity and the antigen concentration giving a histamine release equivalent to half the maximum response (Table 1). No correlation was seen between bronchial sensitivity and allergen concentration giving maximum response or the maximum amount of histamine released. Exclusion from analyses of patients receiving inhaled corticosteroid did not affect the conclusions.

DISCUSSION

Allergen-mediated basophil histamine release has proved to be a valuable test for diagnosing type I allergic reactions in atopic patients, since

the test closely imitates the allergic reaction occurring *in vivo*. Thus, in allergic individuals there is a good correlation between the results of skin tests and histamine release (4). Furthermore, it has been demonstrated that there is a good agreement between the outcome of bronchial allergen provocation and histamine release when comparing positive and negative responders (6). The present investigation was performed in order to further evaluate different effect parameters of histamine release in relation to allergen-specific bronchial sensitivity. Bronchial allergen challenge was therefore compared with the following histamine release parameters: 1) cell sensitivity – the allergen concentration giving half maximum histamine release (which seems to reflect the amount of allergen-specific IgE on the cell surface (5), 2) cell reactivity – the allergen concentration causing maximum histamine release (which seems to reflect a combination of the amount of cell-bound allergen-specific IgE and subcellular mechanisms (5), and 3) the absolute amount of histamine released. Our study showed a significant positive correlation between bronchial sensitivity and basophil cell sensitivity to the house dust mite allergen. This indicates that the thresholds giving release of allergic mediators from mast cells in the lungs and in circulating basophils are closely correlated.

From a clinical point of view our results may imply that the present assay for measurement of *in vitro* release of histamine from blood could be an alternative to the evaluation of the severity of the patients' asthma by bronchial allergen

Table 1

Correlation coefficients (Pearson's r) between bronchial sensitivity to house dust mite and histamine release from washed blood cells expressed as maximum histamine release and as the allergen concentrations giving half maximum and maximum release of histamine.

	Maximum histamine released	Allergen concentration giving	
		half maximum histamine release	maximum histamine release
All patients (n = 60)	0.19	0.60*	0.23
Non-steroid treated (n = 28)	0.31	0.59*	0.30

Test of H₀: slope of regression line = 0; *P < 0.001

provocations. A simple, standardized and accurate method is a prerequisite and the sensitive glass microfibre-based histamine analysis seems to fulfil these demands.

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