

Clinical significance of total IgE and of specific IgE to *Dermatophagoides* spp., grass pollen and other common allergens

II. Relationship to clinical manifestations

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Summary

The relationships of total and specific IgE levels to the clinical manifestations and atopic status of ninety-two subjects, suffering from asthma, rhinitis and infantile eczema in varying combinations, were examined. No significant correlations were found between specific IgE levels to *Dermatophagoides* spp. and grass pollen or between total IgE levels, and the age of the patient, nor the age of onset, duration, severity and frequency of symptoms. A highly significant correlation was found between total IgE levels and the numbers of skin test reactions to a battery of twenty routine tests and to the sum total of the graded sizes of the reactions in each subject.

Introduction

A significant correlation between the presence of specific IgE antibody in the serum to extracts of *Dermatophagoides pteronyssinus*, *D. farinae* and grass pollen and positive prick and nasal test reactions and a clinical history of sensitivity has been reported by Stenius *et al.* (1971). Significant correlations were also found between the amounts of specific IgE and the sizes of the prick test weals. Similar correlations were found for total IgE, presumably because of the contribution of the specific IgE to the levels of total IgE. Wide, Bennich & Johansson (1967) reported that total IgE values were higher in subjects sensitive to more than one allergen than in those with a single sensitivity.

The relationship of the amounts of specific IgE antibody and of total IgE to the severity and other features of the clinical picture is not clear. Hogarth-Scott *et al.* (1971) reported that the total IgE levels were higher in patients with more severe and frequent asthma, though they point out that apparently normal subjects may have high levels and that in some severe asthmatics the levels were 'normal' or low. They did not measure specific IgE antibody. Juhlin *et al.* (1969) and Kumar *et al.* (1971), however, found no correlation between total IgE levels and the presence and severity of asthma or hay fever, though there was a correlation with atopic dermatitis and with the number of positive skin tests. In the present report, based on the earlier study by

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Stenius *et al.* (1971), the relationship of specific IgE antibodies to *Dermatophagoides* spp. and grass pollen and of total IgE levels to the age of onset and severity, of asthma, rhinitis and infantile eczema is examined. The relationship of the atopic status, measured by the number of allergens giving positive prick test reactions and the sizes of these reactions, to the level of total IgE are also assessed.

Materials and methods

The group of ninety-two patients previously reported (Stenius *et al.*, 1971) consisted of sixty-six with asthma, eighty-one with rhinitis and seventeen with eczema, in varying combinations. The clinical features were assessed in terms of: the age of the patient, the age of onset of the symptoms and their severity, frequency and duration. They were regarded as severe if hospitalization was required; moderate if days were lost off work and mild if there was no interference with the patient's daily life. Frequency of symptoms was recorded as continuous, weekly or monthly, or only occasional. The duration of the symptoms was taken as the length of time from the onset to the time of investigation.

Atopic status was assessed in each individual in terms of the number of positive prick test reactions to a battery of twenty common allergens and also in terms of the sum total of the sizes of the reactions which were graded from 0 up to 4+.

Test materials

The allergen extracts tested (Stenius *et al.*, 1971) were made from *Alternaria*, *Aspergillus fumigatus* and *A. terreus*, *Cladosporium herbarum*, *Serpula lacrimans*, *Sporobolomyces*, yeasts, *Candida albicans*, grass, shrub and tree pollens, cat, dog, hen and horse, milk, egg, wheat, fish, nuts and house dust, *D. pteronyssinus* and *D. farinae* and its dog-meal culture medium. A control test was made with carbol saline. The tests were made by the prick method and were read at 20 min. The reactions to house dust and the *Dermatophagoides* spp. was taken to indicate a single sensitivity as were reactions to *A. fumigatus* and *A. terreus* for assessment of the atopic status.

Absolute eosinophil counts were made on the day of the tests.

Measurements of IgE

Total IgE levels were measured by a solid phase sandwich technique (Wide, 1971) as previously described (Stenius *et al.*, 1971). Specific IgE antibodies against extracts of *Dermatophagoides* spp. and grass pollen were measured by the RAST method (Wide *et al.*, 1967) with modifications (Stenius & Wide, 1969).

The results were examined statistically for their correlation coefficients and their *P* values.

Results

Clinical features, specific and total IgE values

Except for a positive correlation (0.4348, $P < 0.001$) between the values for specific IgE antibody to *D. pteronyssinus* and the absolute eosinophil count, there were no significant correlations between levels for IgE and the age of the patient, the age of the onset of the asthma, rhinitis or eczema, nor their duration, severity or frequency.

Atopic status, prick test reactions and total IgE

The range of numbers of prick test reactions to the allergens was wide. No reactions

were obtained in eighteen subjects, twenty-five reacted to one allergen, thirteen to two, twelve to three, nine to four, six to five, one to six, two to seven, one each to eight, nine, ten and eleven allergens and two to twelve allergens.

Table 1 shows a highly significant correlation ($P < 0.001$) between the total IgE levels and the atopic status as estimated by the numbers of positive prick test reactions, i.e. the numbers of allergens to which each subject reacted and also ($P < 0.001$) to atopic status as estimated by the sum total of the grading of the sizes of the prick test reactions in each subject.

Table 1. Atopic status and total IgE

Correlation coefficient of total IgE with:

(1) No. of allergens giving positive reactions 0.4208
 P value < 0.001

(2) Sum total of sizes of positive reactions 0.5252
 P value < 0.001

Discussion

A close correlation has been shown by Stenius *et al.* (1971) between the presence of specific IgE antibody to *Dermatophagoides* spp. and grass pollen and clinical history and provocation tests. They also found a close correlation between the sizes of the prick test weals and the amounts of specific IgE antibody to the above allergens. The present report shows a close correlation between total IgE levels and the numbers and sizes of reactions to a battery of twenty common allergens. These findings are evidence of Type I allergic sensitization and of the long recognized capacity of atopic subjects to produce IgE antibody to the common allergens.

The present investigation shows no significant correlation between the amounts of specific and total IgE and the severity of the clinical manifestations, nor to their age of onset and duration, thus confirming the similar reports by Juhlin *et al.* (1969) and by Kumar *et al.* (1971).

This raises an important question, since a relationship between local IgE and amounts of specific IgE in the serum is suggested by the correlation between the latter and the sizes of the prick test weals. There was a suggestion that the higher the specific IgE values the lower the concentration of allergens needed to elicit nasal reactions as shown in Tables 9 and 10 in the report by Stenius *et al.* (1971). There is, however, no information available on local IgE concentrations in the bronchi and it may be that even if these were to correlate with the serological levels, other factors besides the IgE mediated reaction could influence the appearance and severity of symptoms. It is a frequent clinical observations that the size of the skin test reactions to common allergens may show no relationship to the presence or severity of symptoms. This is supported by McAllen, Assem & Maunsell (1970) who found differences in reactivity of the skin and the nose by measuring threshold reactions to *D. pteronyssinus* extract. Radermecker (1971, 1972) has found that in monkeys sensitized passively with human reaginic serum, local sensitization of the bronchi was produced but asthmatic reactions were not elicited by aerosol challenge. This suggests that other mechanisms, possibly

non-immunological, are concerned in the production of symptoms, such as the blockade of beta-adrenergic receptors postulated in asthma by Szentivanyi (1971).

The correlation between specific IgE levels to *D. pteronyssinus* and the absolute eosinophil count may be due to the perennial presence of house dust allergen in the environment, and also perhaps to the fact that the investigations were made in the autumn and early winter when the *Dermatophagoides* spp. may show a seasonal spurt in growth (Voorhorst *et al.*, 1967). Similarly the absence of correlation between specific IgE antibody to grass pollen and the eosinophil count could be explained by the investigation being made outside of the grass pollen season.

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