

Identification of allergen-specific IgE antibodies in the sera of African asthmatics

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Summary

Of eighty African asthmatics, sixty-three had significant levels of specific IgE against the house dust mite *Dermatophagoides pteronyssinus*. By contrast, grass-specific IgE was found in six patients and mould-specific IgE in none. Sixty-three patients also had symptoms predominantly during the rainy season.

Positive skin tests against *D. pteronyssinus* correlated well with the presence of mite-specific IgE, as did the size of these skin test weals with the amount of specific IgE. For grass pollen and moulds there was no such relationship. There was no correlation between a history of sensitivity to house dust and either skin tests or specific IgE against *D. pteronyssinus*.

The results support previous findings that it is allergy to house dust mite and not to grass pollens or moulds which is important in producing the seasonal symptoms in our patients.

Introduction

Allergy to the house dust mite *Dermatophagoides* has been known to be important in asthma in many parts of the world for some years, and more recently several reports have also demonstrated its importance in Africa (Ordman, 1971; Gitoho & Rees, 1971; Commey & Haddock, 1973; Buchanan & Jones, 1974; Warrell *et al.*, 1975; Godfrey, 1975). In a study of Rhodesian African asthmatics, we (Cookson & Makoni, 1975) have suggested that not only was it the most important allergen but it also seemed to be responsible for seasonal asthma. Grass pollen allergy was found to be uncommon.

These conclusions were based on patients' histories and skin tests, and work was therefore undertaken to see if they were confirmed by serum immunoglobulin E (IgE) estimations. Results of some of this work (Merrett, Merrett & Cookson, 1976) have shown that our (i.e. urban) asthmatics had higher total IgE levels than urban controls, but lower levels than controls from a filariasis-endemic rural area. We also

showed that these rural subjects had a relatively high prevalence of grass-specific IgE antibodies.

In this paper we now present details of allergen-specific IgE antibodies in the sera of asthmatic patients and relate them to the clinical features and skin test results.

Patients and methods

Eighty patients (forty-six males and thirty-four females) were investigated. Their average age was 36.1 years and the mean age of onset of symptoms was 28.8 years.

Selection of our patients has been described previously (Cookson & Makoni, 1975). They were not identical with that study, but there was a considerable overlap. Investigations included an historical questionnaire and skin tests using the prick method with a variety of common allergens (Bencard). The latter were considered positive when weal diameters equal to or greater than 1 mm (after subtraction of any control weal) were produced.

Total serum IgE was determined by a double antibody radioimmunoassay (Merrett & Pantin, 1975) and IgE antibodies specific for *D. pteronyssinus*, *D. farinae*, Bermuda grass, Timothy grass, *Cladosporium herbarum*, *Alternaria tenuis* and *Aspergillus fumigatus* were estimated by the radioallergosorbent test (Phadebas RAST, Pharmacia GB Ltd). Results for specific IgE were expressed on a score system 0, 1, 2, 3, 4, where 2 or more was regarded as positive.

Fisher's exact test has been used for all correlations except when otherwise stated.

Results

On history taking, fifty-two patients (65%) thought that their asthma was worse when their house was being swept or dusted (suggesting house dust sensitivity); twenty-one (26.3%) thought they were sensitive to grass pollen and eleven (13.8%) to shrub or flower pollen. Very few patients were sensitive to other allergens. Sixty-three patients had symptoms predominantly during the rainy season (November to March).

On skin-testing, the number positive of the number tested for the commoner allergens were: *D. pteronyssinus* 71/80; grass pollen 28/80; tree pollen 28/79; shrub and flower pollen 30/80; *Cladosporium* 14/70; *Aspergillus* 9/63; *Alternaria* 16/71; dog dander 33/67; and cat dander 28/60. However, most of these reactions were small and weals greater than 5 mm in diameter occurred only with *D. pteronyssinus* (twenty-five patients), cat dander (three patients) and shrub and flower pollens (one patient). Only two patients had negative reactions to all allergens tested.

The logarithmic mean for the total IgE levels was 799 u/ml.

Sixty-three patients (78.8%) had positive RAST scores against *D. pteronyssinus*, and fifty-eight (72.5%) against *D. farinae*. By contrast, four patients had similar scores against Timothy grass, four against Bermuda grass (six against either or both), and none against any of the three moulds.

There were highly significant correlations between positive skin tests with *D. pteronyssinus* and RAST scores against both *D. pteronyssinus* and *D. farinae* ($P < 0.0001$). By contrast, there was no relationship between skin tests and RAST scores for grass pollens. The RAST scores for *D. pteronyssinus* and *D. farinae* correlated well with both the total IgE levels ($P < 0.001$) and the size of the skin test weal with *D. pteronyssinus* ($P < 0.01$) (Spearman's rank correlation coefficient).

Fifty-seven of the sixty-three patients whose symptoms were worse during the

rains had positive skin reactions to *D. pteronyssinus*. However, a similar proportion (five patients out of six) of perennial asthmatics were also skin test positive. Likewise, there was no relationship between seasonal symptoms and mite-specific IgE antibodies estimated by RAST. There was also no relationship between a history of sensitivity to house dust and either skin tests or RAST to *D. pteronyssinus*.

Discussion

This study has confirmed that the major allergen in our patients seems to be *Dermatophagoides* and that grass pollens play little or no part. This is surprising, considering that most of them had seasonal asthma. In a previous study (Cookson & Makoni, 1975) a relationship was found between asthmatic symptoms during the rainy season and skin test reactivity against *D. pteronyssinus*. This suggested the possibility that the Rhodesian climate encourages mite growth only during the rainy season, and that this may account for the seasonal symptoms in our patients.

In the present study, although most of the patients who were worse during the rains also had positive skin tests, a similar proportion of the perennial asthmatics were also positive. Numbers of the latter were small, however, and a larger series might have shown a relationship.

It could be said that the low level of grass sensitivity detected suggests that we may not have been testing against grasses actually present in Rhodesia. Grass pollen counts in Salisbury do show a rise during the rainy season (Ordman, unpublished), but it is not possible to distinguish between different grasses by examining their pollen. Common grasses in Rhodesia include Bermuda, brome, red top and rye, all of which were present in our skin-testing solution, and since many different grass pollens show marked cross-reactivity by RAST it would seem unlikely that any important grass sensitivity has been missed.

Our results on skin testing are in contrast to those of Hendrick *et al.* (1975) who, in Britain, found an almost equal prevalence of positive skin tests to *D. farinae* (58%) and pollens (56%) in six-hundred and fifty-six asthmatics. Their patients also had a lower percentage of extrinsic asthmatics (84%), as judged on skin test results, than our series. Similarly, Stenius *et al.* (1971) found a comparable range of specific IgE levels against *D. pteronyssinus* and grass pollen in ninety-five allergic subjects. The apparent paucity of grass pollen sensitivity in our patients remains unexplained.

Our results confirm the good correlations previously shown to exist between: (1) skin tests and RAST for *D. culinae* (identical with *D. farinae*) (Stenius & Wide, 1969); (2) skin test weal diameters and RAST for *D. pteronyssinus*; and (3) total and mite-specific IgE levels in terms of ranking of values (Stenius *et al.*, 1971).

Unlike the latter authors, however, we have not found a significant correlation between a history of sensitivity to house dust and either skin tests or RAST for *D. pteronyssinus*, perhaps because some of our patients, particularly the men, have trouble in answering this question.

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References

- BUCHANAN, D.J. & JONES, I.G. (1974) Mites and house dust mite allergy in bronchial asthma in Northern Zambia. *Postgraduate Medical Journal*, **50**, 680.
- COMMEY, J.O.O. & HADDOCK, D.R.W. (1973) Skin sensitivity to house dust mite extracts in Ghanaian asthmatics in Accra. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, **67**, 109.
- COOKSON, J.B. & MAKONI, G. (1975) Seasonal asthma and the house dust mite in tropical Africa. *Clinical Allergy*, **5**, 375.
- GITOHO, F. & REES, P. (1971) High altitude and house dust mites. *British Medical Journal*, **3**, 475.
- GODFREY, R.C. (1975) Asthma and IgE levels in rural and urban communities in The Gambia. *Clinical Allergy*, **5**, 201.
- HENDRICK, D.J., DAVIES, R.J., D'SOUZA, M.F. & PEPYS, J. (1975) An analysis of skin prick test reactions in 656 asthmatic patients. *Thorax*, **30**, 2.
- MERRETT, T.G., MERRETT, J. & COOKSON, J.B. (1976) Allergy and parasites: the measurement of total and specific IgE levels in urban and rural communities in Rhodesia. *Clinical Allergy*, **6**, 131.
- MERRETT, T.G. & PANTIN, C.F.A. (1975) Increasing the precision and speed of the separation step in radioimmunoassays. *Clinica chimica acta*, **65**, 131.
- ORDMAN, D. (1971) The incidence of 'climate asthma' in South Africa: its relation to the distribution of mites. *South African Medical Journal*, **45**, 739.
- STENIUS, B. & WIDE, L. (1969) Reaginic antibody (IgE), skin and provocation tests to *Dermaphagoides culinae* and house dust in respiratory allergy. *Lancet*, **2**, 455.
- STENIUS, B., WIDE, L., SEYMOUR, W.M., HOLFORD-STREVEVS, V. & PEPYS, J. (1971) Clinical significance of specific IgE to common allergens. *Clinical Allergy*, **1**, 37.
- WARRELL, D.A., FAWCETT, I.W., HARRISON, B.D.W., AGAMAN, A.J., IBO, J.O., POPE, H.M. & MABERLY, D.J. (1975) Bronchial asthma in the Nigerian savanna region. *Quarterly Journal of Medicine*, **XLIV**, 325.

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