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The Pattern of Skin Test Reactivity to Aeroallergens in Asthmatic Children in Riyadh

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INTRODUCTION

Identification of allergens prevalent in any region is an essential requirement for the informed medical management of allergic individuals. There is little clinical advantage in testing patients for sensitivity to allergens which are not present in their own environment. The presence of allergens is greatly influenced by environmental conditions, by patients' living conditions, cultural background, and local habits.

The present investigation was undertaken to determine the pattern of immediate type hypersensitivity reactions to a panel of aeroallergens selected from those identified by studies conducted in the Riyadh area including analysis of air, sampling for pollens and fungi, as well as analysis of dust samples from patients homes (1–4).

MATERIALS

A total of 55 children (31 males and 24 females) attending the Paediatric Allergy Clinic at King Khalid University Hospital entered the study. Their ages ranged from 6 to 13 years. Each child was diagnosed as suffering from bronchial asthma following a full clinical examination and history.

METHODS

All patients were tested with a set of 135 inhalant allergens, obtained from Hollister Stier Limited (Spokane, WA). The allergy extracts were grouped into *pollens*; including tree, grass, and weeds; *fungal spores* including a range of species identified from spore traps in the region; *insect, animal, and indoor allergens* including dust mite mix, *D. farinae,* dog hair, cat dander, cockroach allergens, cotton flock, sheep wool, and horse epithelium. A positive control, with histamine dihydrogen phosphate 1 mg/ml, and negative control were included in the panel in all subjects.

A standard skin prick method was used where a drop of allergen solution was applied on the forearm and the skin pricked through the drop with a lancet. Excess solution was then blotted off and the results were recorded after 15 minutes. The result was considered

positive if the wheal diameter measure 3 mm or more. Results were graded according to the wheal diameter as <3 mm: negative; 3 mm: mild; 3–5 mm: moderate; and >5 mm: significant.

All patients discontinued antihistamines 48 h before skin testing, and patients on long-term corticosteroid therapy were excluded.

RESULTS

One or more positive skin reactions occured in 35 (63.7%) of the asthmatic children and 25 patients (36.6%) were skin test negative (Fig. 1). Reactions were most common and strongest to the indoor and animal panel and to pollens. Fungal reactions were less common and weaker (Table 1). Among the 35 skin test-positive children, 69 skin reactions occurred to indoor allergens, 30 of them significant. A similar distribution was seen with the pollens, but in general, the fungal reactions were usually mild to moderate.

Tables 2, 3, and 4 list the frequency of reactions to individual antigens. By far the most common reactions occurred with the cat dander (27 positive), cockroach (16 positive), and cotton flock (10 positive).

Among the grasses Bermuda grass gave the most frequent reaction; 10 of the 12 being of 5 mm or greater in wheal distance.

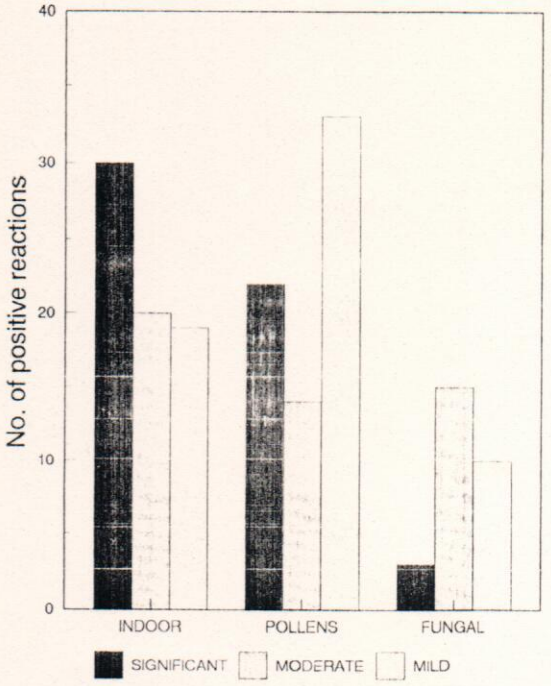

Figure 1. Overall reactions to aeroallergens in asthmatic children.

In contrast, the reactions to the fungal antigens were less common, with *Ulocladium* producing reactions in 6 children and *Alternaria* with *Cladosporium* in 5 and 4, respectively.

Table 1. Overall Reactions to Aeroallergens in Asthmatic Children

ALLERGENS	TOTAL NUMBER POSITIVE	DEGREE OF SENSITIVITY		
		SIGNIFICANT	MODERATE	MILD
Indoor and animal allergens	69	30	20	19
Pollens, tree, grass and weeds	69	22	14	33
Fungal spore allergens	28	3	15	10

Numbers refer to positive reactions.
A patient may have more than one positive reaction.

Table 2. Skin Test Reactivity to Insect, Animal, and Indoor Allergens in Asthmatic Children

ALLERGENS	TOTAL NUMBER POSITIVE	DEGREE OF SENSITIVITY		
		SIGNIFICANT	MODERATE	MILD
Cat fur	27	22	2	3
Cockroach	16	3	7	6
Cotton flock	10	2	5	3
Sheep wool	7	1	2	4
Dog hair	6	1	3	2
Dust mite mix	3	1	1	1

Table 3. Skin Test Reactivity to Pollen Allergens in Asthmatic Children

POLLEN ALLERGENS	TOTAL NUMBER POSITIVE	DEGREE OF SENSITIVITY		
		SIGNIFICANT	MODERATE	MILD
Bermuda	12	10	–	2
Phragmidiothrix comm	8	4	1	3
Poa. pratens	7	2	3	2
Lol. perennial	7	1	2	4
Hordium sativum	7	–	2	5
Phel. pratens	6	1	1	4
Rumex crisp	6	–	–	6
Zea mays	5	1	2	2
Chenopodium album	4	–	1	3
Acacia	4	1	–	3
Salix caprea	3	–	3	–
Plant major	3	–	–	3
Artemesia	3	1	–	2

Table 4. Skin Test Reactivity to Fungal Allergens in Asthmatic Children

ALLERGENS	TOTAL NUMBER POSITIVE	DEGREE OF SENSITIVITY		
		SIGNIFICANT	MODERATE	MILD
Ulocladium chart	6	1	2	3
Alternaria	5	1	1	3
Cladosporium herb	4	–	2	2
Phoma herbarum	3	–	1	2
Aspergillus fumigatus	1	1	–	–
Aspergillus niger	1	–	–	1
Rhizopus	1	–	–	1

DISCUSSION

Four major conclusions can be derived from this study.

First, two thirds of a group of asthmatic children were found to skin test positive with the test panel used. This represents a much lower proportion of skin test-positive asthmatic children than in other countries such as the United Kingdom, United States, and Australia, where figures in excess of 90% are the norm (8). The reason for the lack of positive reaction in the other children relates either to the presence of asthma without atopy, lack of exposure to potential sensitizing allergens, or lack of the appropriate antigens relevant to their disease in the skin test panel.

Second, the results show that up to 26 allergens are necessary to detect all the positive reactions in these children, demonstrating the broad range of sensitivities which occur in Riyadh environment (1-5).

Third, the domestic allergens, particularly cat and cockroach, stand out as the most important in the test panel, occurring most frequently and with the strongest reactions. This demonstrates the importance of household dust, and the household environment in producing Type 1 hypersensitivity reactions in asthmatic children (6-13).

Fourth, in contrast to reactions in temperature climates, responses to dust mite are most uncommon (3 postive), reflecting the lack of dust mites in the low humidity of the Riyadh environment (5,14).

The high responses to cat antigen have previously been described in Saudi Arabia (5) in patients with rhinitis. It is curious that most families deny much contact with cats, but the previous report suggested that cats commonly use stored carpet as resting places, thus providing the opportunity for cat antigen to be inhaled by children who use these carpets at other times.

The cockroach sensitivity has been implicated as a cause of perennial allergic rhinitis and asthma and has been found in the rhinitis patients of the study reported above. Bernton and Brown (7) demonstrated a significantly greater frequency of skin test sensitivity in individuals exposed to environments heavily contaminated with cockroach. Because of the prevalence of this insect in the Saudi environment we feel it may turn out to be a most important indoor allergen and a major constituent of household dust (7-10).

Currently, we are pursuing studies with a locally prepared extract to better define the frequency of cockroach sensitivity in a larger patient environment. The local Arabian cockroach may display different antigenicity from the American and German cockroach, which are the constituents of the skin test extract used (12).

The reactions to grass pollens demonstrate the higher frequency of responses to Bermuda grass, which has previously been demonstrated by Al Frayh et al. The lower frequency to fungal allergen may reflect the lack of appropriate antigens in the skin test panel and locally prepared fungal extracts are in the process of development for use to determine more accurately the true allergenicity of these potential aeroallergens in the local environment (3,4).

Our findings indicate the urgent requirement for further study in this area, to identify possible missing allergens, to develop local allergen testing standards, to determine the clinical contribution of these toward the development of asthma and other allergic conditions, then to examine the potential for environmental modification in alleviating the prevalence and morbidity of these conditions.

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