IgE-MEDIATED SKIN REACTION AMONG ASTHMATIC CHILDREN IN RIYADH

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فحص خمسة وخمسين طفلا مربوًا (مريضا بالربو)، تتراوح أعمارهم بين ٦ - ١٣ عاما، يراجعون عيادة للحساسية عند الأطفال بمجموعة تجارية مكونة من خمس وثلاثين مستأرج بالاستنشاق. صنفت الخلاصات المستأرجية ضمن مجموعة الطلع، وتشمل الأشجار والأعشاب والحشائش ثم مجموعات الأبواغ الفطرية والحشرات والحيوانات وغيرها من المستأرجات المنزلية. أظهر ٣٥ طفلا مربوًا (٦٣,٦٪) تفاعلا جلديا إيجابيا واحدا أو أكثر. كانت التفاعلات أكثر وقوعا وشدة في المستأرجات المنزلية والحيوانية وأنواع الطلع. أما التفاعلات الفطرية فكانت أضعف وأقل تواردا. وهذا يعني أن نسبة الأطفال المربوين الذين يظهرون تفاعلا جلديا إيجابيا أقل منها في البلدان الغربية. وقد يعود ذلك أما لوجود الربو بدون تأتّب أو قلة التعرض للمستأرجات المحتملة أو قلة المستضدات المناسبة للمرض في مجموعة فحص الجلد هذه.

Fifty-five asthmatic children aged 6–13 years attending a pediatric allergy clinic were skin tested with a panel of 35 inhalant commercial allergens. The allergen extracts were grouped into pollen including trees, grasses and weeds, fungal spores, insect, animal and other indoor allergens. Thirty-five (63.6%) of the asthmatic children had one or more positive skin reactions. Reactions were most common, and strongest to the indoor and animal panel and to pollens. Fungal reactions were less common and weaker. This represents a lower proportion of skin test–positive asthmatic children than other Western countries. This might relate either to the presence of asthma without atopy, lack of exposure to potential allergens, or lack of appropriate antigens relevant to the disease in the skin test panel.

Identification of allergens in any region is essential for the informed clinical management of allergic diseases. There is little clinical advantage in testing patients for sensitivity to allergens which are not present in their ambient environment. The presence, or absence, of allergens is greatly influenced by various factors such as environmental conditions, patients' living conditions, planting, surroundings, presence of animals, etc.

The present investigation was undertaken to determine the pattern of immediate hypersensitivity reactions to a panel of aeroallergens selected on the basis of studies conducted in the Riyadh area, which included analyses of air samples for pollen and fungi, and analyses of dust samples from patients' homes [1–4].

Material and Methods

Fifty-five children, 31 boys and 24 girls, attending the Pediatric Allergy Clinic at King Khalid University Hospital, Riyadh, entered the study. They were between 6–13 years of age. All children included were diagnosed as suffering from bronchial asthma based on a detailed history, and a full clinical examination. All children included had been living in the Riyadh area for several years.

All patients were tested with a panel of 35 inhalant commercial allergens, obtained from Hollister Stier ALK and Greer Laboratories. Extracts from pollen grains were standardized with weight:volume ratio w/v: 1:20; fungal spores w/v 1:10, while cat hair (ALK SPT, 5Q, 555), *Dermatophagoides*

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farinae and house dust mites mix (ALK SPT SQ 503, 504) and cockroach (Greer Laboratories, SPT, B26) were all purified allergens. These allergen extracts were grouped into pollen, including trees, grasses and weeds, fungal spores, including a range of species identified from spore traps in the region, and insect, animal and other indoor allergens, including dust mite mix, *Dermatophagoides farinae,* dog hair, cat dander, cockroach, cotton flock, sheep wool and horse epithelium. A positive control, with histamine dihydrogen phosphate (1 mg/ml), and normal saline as negative control, were included in the panel for all subjects.

The children had discontinued antihistamines 48 hours before being skin tested. Asthmatic children on long-term corticosteroid therapy were excluded from the study. A detailed history of patients' allergic condition was obtained, and those showing a tendency for "intrinsic asthma" were also excluded.

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 (BD-microlance^{R} [Becton & Dickenson]). Excess solution was then blotted off, and the results were recorded after 15 minutes. A result was considered positive with the wheal diameter measuring 3 mm or more. The results were graded according to the wheal diameter as $<$ 3 mm : negative; 3 mm : mild; 3–5 mm: moderate and $>$ 5 mm : strong.

Results

Thirty-five (63.6%) of the asthmatic children showed one or more positive skin reactions, and 20 patients (36.4%) were skin test negative (Figure 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 allergen. Thirty of them were significant. A similar distribution was seen with the pollens, but in general the fungal reactions were only mild-to-moderate.

Tables 2, 3, and 4 list the frequency of reactions to individual antigens. By far the most common reactions occurred with 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 diameter. 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.

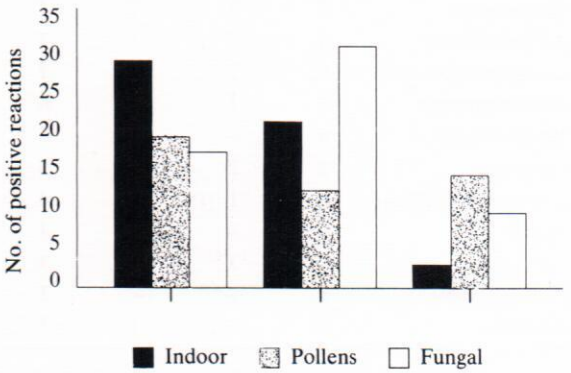

FIGURE 1. Overall pattern of skin test reactivity to aeroallergens in children in Riyadh.

TABLE 1. *Overall reactions to aeroallergens in asthmatic children.*

Allergens	Degree of sensitivity			Total number positive
	Mild	Moderate	Strong	
Indoor and animal allergens	19	20	30	69
Pollen (tree grass and weeds) allergens	33	14	22	69
Fungal spore allergens	10	15	3	28

– 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	Degree of sensitivity			Total number positive
	Mild	Moderate	Strong	
Cat fur	3	2	22	27
Cockroach	6	7	3	16
Cotton flock	3	5	2	10
Sheep wool	4	2	1	7
Dog hair	2	3	1	6
Dust mite mix	1	1	1	3

TABLE 3. *Skin test reactivity to pollen allergens in asthmatic children.*

Allergens	Degree of sensitivity			Total number positive
	Mild	Moderate	Strong	
Cynodon dactylon (Bermuda grass)	2	–	10	12
Phragmites communis	3	1	4	8
Poa pratensis	2	3	2	7
Lolium perenne	4	2	1	7
Hordeum sativum	5	2	–	7
Phleum pratense	4	1	1	6
Rumex crispus	6	–	–	6
Zea mays	2	2	1	5
Chenopodium album	3	1	–	4
Acacia	3	–	1	4
Salix caprea	–	3	–	3
Plantago major	3	–	–	3
Artemisia	2	–	1	3

TABLE 4. *Skin test reactivity to fungal allergens in asthmatic children.*

Allergens	Degree of sensitivity			Total number positive
	Mild	Moderate	Strong	
Ulocladium chartarum	3	2	1	6
Alternaria alternata	3	1	1	5
Cladosporium herbarum	2	2	–	4
Phoma herberum	2	1	–	3
Aspergillus fumigatus	–	–	1	1
Aspergillus niger	1	–	–	1
Rhizopus	1	–	–	1

Discussion

Four major conclusions derive from this study.

Firstly, two thirds of the asthmatic children tested were found to be skin test–positive, with the allergens 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. 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.

Secondly, 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 the Riyadh environment [1-5].

Thirdly, the domestic allergens, particularly cat and cockroach, appeared to be the most important in the test panel, providing frequent and strong reactions. This demonstrates the importance of household dust, and the indoor environment, in producing Type 1 hypersensitivity reactions in asthmatic children [6,7,8-12].

Fourthly, in contrast to reactions in temperate climates, responses to house dust mites are more uncommon (3 positive), reflecting the lack of dust mites in the low humidity of the Riyadh environment [5,13]. However, it is possible that some people who were sensitized by *Dermatophagoides pteronyssinus* or *D. farinae* abroad, and in other parts of the Kingdom, such as Jeddah (where high humidity provides better growth opportunity for house dust mites to thrive), will react to the above allergen extracts. The development of symptoms requires subsequent exposure to specific allergens in the patients' ambient environment. The very low sensitivity to house dust mite antigen in Riyadh is attributable to the negligible existence of these mites. This is supported by our study on indoor allergens in Riyadh [3], and the low humidity in Riyadh could be considered to be an important factor also. Unlike Riyadh, a majority of the western countries have high humidity. The two house dust mite species give frequent positive test reactions, and are major indoor allergens causing bronchial asthma and other perennial symptoms of respiratory allergic diseases.

The high responses to cat antigen have previously been described in Saudi Arabia [5] in patients with rhinitis. While most families indicated that direct cat contact was low, previous reports suggested that cats commonly use stored carpets as resting places, 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 be the source of a most important indoor allergen, and a major constituent of household dust [7–9].

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 [11].

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]. Some fungal allergens, recorded in our environment [1], are different in their specific nature than those recorded in the waste. *Ulocladium* spp were recorded from both the outdoor, and indoor, environment in Riyadh and are taxonomically related to *Alternaria* spp. In some cases it is difficult to differentiate between the two conidia on air samples slides. However, a comparatively higher proportion of skin reactions with *Ulocladium* also indicates the allergenic importance of individual sensitivities in the region. Comprehensive information on *Ulocladium* will result from a study communication which is now being conducted.

These findings indicate the need for further study in this area, to identify other potential allergens, to develop local allergen testing standards, to determine the clinical contribution of these towards the development of asthma and other allergic conditions, and to examine the potential for environmental modification in alleviating the prevalence and morbidity of these conditions.

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