

ALLERGIC RHINITIS – ANALYSIS OF SKIN TESTING IN 774 PATIENTS

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SUMMARY

*This study shows that out of 774 patients tested, the house dust mite (*Dermatophagoides pteronyssinus*) provoked the maximum response (51.81%) the house dust was second (42.81%), and shrimp was third (23.92%). The moderate allergenic extracts were cat fur (12.79%), dog fur (10.72%), cockroach (8.47%) egg white (7.56%) and orris powder (6.30%). Among the low allergenic extracts were *Aspergillus fumigatus* (5.38%) *Staphylococcus aureus* (3.53%) and chicken feathers (3.18%).*

The authors are of the opinion that the skin sensitivity test is an important diagnostic tool in allergic rhinitis and since this is a preliminary study any short listing of allergens to be used is not recommended yet.

Skin sensitivity tests is a useful tool for differentiating allergic rhinitis from vasomotor rhinitis. Estimation of allergen specific IgE concentration in the serum will not offer any major advantages over the intradermal skin test in determining the clinical significance of house dust mite allergy.²¹ The development of local materials for skin testing may enhance the usefulness of these investigations.

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INTRODUCTION

Perennial rhinitis is a common condition both in ENT as well as in general practice. An analysis in an ENT Clinic in Kuala Lumpur by Tan¹ showed that of 100 consecutive patients 34% percent had perennial rhinitis. Four percent of patients attending a general practice in Kuala Lumpur had the same ailment during the same period. Perennial rhinitis is characterised by rhinorrhea, paroxysmal sneezing and nasal obstruction or a combination of these symptoms. Niels Mygind² has classified rhinitis as purulent and non purulent. The latter consists of 3 types which include a) allergic rhinitis which gives a positive skin test to an allergen and an increase in nasal eosinophilia, b) cholinergic rhinitis (also known as vasomotor rhinitis) which gives a negative skin test. Nasal eosinophilia and nasal polyps are absent and c) intrinsic rhinitis characterised by negative skin tests, nasal eosinophilia and the presence of nasal polyps.

Seasonal allergic rhinitis or Hay Fever is present in temperate countries and is uncommon in the tropics. Although these 3 entities can be differentiated by clinical and haematological methods it is rather difficult to draw a line dividing them clinically.

The objective of this study is to evaluate the prevalence of allergic rhinitis amongst patients who presented with the above symptoms at the ENT clinic of Universiti Kebangsaan Malaysia, Kuala Lumpur. Reports on the pattern of skin sensitivity tests to various allergens in Malaysia are lacking although skin tests are carried out in various centres in the country.

It is useful to know the pattern of skin positivity

to the locally available commercial extracts. In cases where the allergen is not found in this country or, if it is a 'variant' compared to the local allergen, then it would facilitate allergists in the right choice of allergens in skin testing. This would avoid wastage of using allergens which are non-existent under local conditions.

Skin testing is a simple, fast and relatively safe procedure. In spite of the false positive and false negative results it can help allergists elucidate whether there is an underlying allergic factor. Though the confirmative diagnosis of allergic rhinitis can only be made after considering the absolute blood eosinophilia count, increase in eosinophils in nasal secretions, increase in blood IgE levels and skin hypersensitivity reaction, the skin prick test offers a simple and fast screening procedure.

A regional report on skin sensitivity tests by P.C. Teoh⁵ showed that out of 54 unselected adult asthmatics, the highest positive skin reaction was to *Dermatophagoides pteronyssinus* (65 percent) and house dust (52 percent). The other allergens used were *Aspergillus fumigatus* which evoked a 5.5 percent positive skin reaction, cat fur (3 percent) dog hair (3 percent) and whole egg (0 percent). Seven other allergens used did not evoke any skin reaction.

MATERIALS AND METHODS

Patients

Seven hundred and seventy-four patients attending the ENT Clinic at University Kebangsaan Malaysia at the General Hospital Kuala Lumpur from January 1981 to December 1982 with symptoms of perennial rhinitis such as rhinorrhea, paroxysmal sneezing and nasal obstruction were tested for skin sensitivity to various allergens.

The mean age of the patients was 35 years and none of them had been hyposensitised to any allergen. The clinical history was recorded by means of a detailed questionnaire which was completed by a technician and checked by the examining physician.

The Skin Test

All solutions of allergens were from Bencard, England. The 14 allergens selected were on the basis of their likely presence common in the local environment. Prior to skin testing subjects were instructed to refrain from any anti-histamine for 48

hours.

The prick test, being superior to the intradermal test was used throughout. The volar aspect of the forearm was chosen. Sites were marked out with a washable marker at distances of 2 cm apart in two longitudinal rows 2 cm across. A drop of the test agent was applied to the skin and a special lancet was used to depress the skin to just enter it and then lifted without drawing blood. Readings of the size of the weal and flare were taken 15 minutes later. The patients were observed for at least an hour from the time of the test to detect any untoward side effect. A positive reading is made when the weal size is more than 2mm above control. The flare was disregarded because of the difficulty in assessing its extent in pigmented skin.

RESULTS

Of the 774 patients there were 422 Malays, 221 Chinese, 111 Indians and 20 'miscellaneous' in the ethnic breakdown.

It was found that *Dermatophagoides pteronyssinus* gave the highest positive reaction (51.81 percent) in the subjects; followed by the house dust (42.81 percent) and shrimp (23.92 percent); (see Table I). The allergens in the moderate allergenic group are egg whole (17.77 percent), crab (16.13 percent), B2 pollen (15.92 percent) cat fur (12.79 percent) and dog fur (10.72 percent). Low allergenicity was seen with cockroach (8.47 percent), egg white (7.56 percent), orris powder (6.30 percent), *Aspergillus fumigatus* (5.38 percent), *Staphylococcus aureus* (3.53 percent) and chicken feathers (3.18 percent).

Table II shows the results of the skin prick sensitivity tests using 9 allergens for the year 1981/1982. Table III shows another 6 allergens, 3 of which were used in 1981 but were dropped in 1982 because of low allergenicity and another 3 allergens added in 1981.

Since some patients elicit more than + 1 mm weal size to the 'control' solution, calculations of the absolute number of patients being positive to a particular allergen was obtained by subtracting from the total number of patients having 2 mm or more (2 + X) mm weal sizes the number of patients having a reaction of more than 2 mm or (2 + X) mm weal sizes to the 'control' solution.

Results from Table I & II show that *Dermatophagoides pteronyssinus* not only provoked the highest positive reaction amongst the subjects

TABLE I
THE SEVERITY IN ALLERGENICITY TO VARIOUS
ALLERGENS IN DESCENDING ORDER

Degree of allergenicity	Allergen	Number of positive patients	Percentage positivity
High Allergenicity	Dermatophagoides pteronyssinus	401	51.81
	House Dust	327	42.81
	Shrimp	178	23.92
Moderate Allergenicity	*Egg (whole)	67	17.77
	Crab	120	16.13
	*Group B2 pollen	60	15.92
	Cat fur	99	12.79
	Dog fur	83	10.72
Low Allergenicity	Cockroach	63	8.47
	*Egg (white)	30	7.56
	*Orris powder	25	6.30
	Asp. fumigatus	40	5.38
	*Staph aureus	14	3.53
	*Chicken feathers	12	3.18

*Denotes testing done in only one year ie. either 1981 or 1982.

Total number of patients tested 774.

but also the highest variation in the weal sizes; ie. from 1 mm to more than 12 mm. The largest weal size recorded for this allergen was 21 mm and this was found in 3 subjects.

The house dust allergen which ranks second in the skin prick test in producing a positive skin reaction also shows a wide variation in the weal size: ie. from 1 mm. to 9 mm. The other allergens produce in a decreasing order the degree of weal size according to the positivity of the skin reaction. The least allergenic substance chicken feathers showed the smallest variation in weal size, ie. from 1 mm to 4 mm.

DISCUSSION

The findings of this study are consistent with regional reports which incriminate the house dust mite in allergic rhinitis in Malaysia ⁵ in Indonesian children, ⁶ and in bronchial asthma in Singapore. ³

The importance of allergy to domestic mites was first described by Dekker ⁷ but the allergic importance of domestic mites in house dust has been investigated by Voorhorst ⁸ and Oshima ⁹ in 1964. Their results have been confirmed by many other workers. ¹⁰ All agree that the most probable source of allergen in the house dust is the mite, *Dermatophagoides pteronyssinus*.

Work done by Furumizo ¹¹ on the mite fauna of house dust samples from Petaling Jaya showed that *Dermatophagoides pteronyssinus* was common in the house dust samples collected from the houses of patients who were allergic to house dust mite. Thomas ⁵ showed a high incidence (83.7%) of positive skin reactions with extracts of mites among individuals of a group of rhinitis patients from around Kuala Lumpur who were clinically sensitive

TABLE II
RESULT OF SKIN PRICK SENSITIVITY TEST IN PATIENTS ATTENDING THE ENT CLINIC AT UKM,
KUALA LUMPUR FOR 1981/1982

Allergens	Size of weals in mm.	Weal Size (mm)														
		0	1	2	3	4	5	6	7	8	9	10	11	12	> 12	
Control		534	60	50	23	4										
House Dust		306	62	88	114	65	68	23	19	19	8					
Dermatophagoides Pteronyssinus		233	65	119	97	69	70	37	22	22	14	18	1	2	7	
Cat fur		550	56	67	45	27	12									
Dog fur		549	48	60	42	33	16	2	5							
Crab		534	43	74	67	27	18	7	2	0	2					
Shrimp		457	61	83	91	49	19	6	3	2	0	2				
Cockroach		581	52	64	42	20	12	2								
Aspergillus fumigatus		599	58	76	30	7	2	0	0	2						

TABLE III
RESULTS OF SKIN PRICK SENSITIVITY TEST FOR 'OTHER' ALLERGENS FOR 1981 or 1982

Year		0	1	2	3	4	5	6	7	8	9	10	11	12	> 12
1980	Control	252	5	13	5	1									
	Egg (whole)	272	19	39	36	6	4	0	1						
	Group B2 polien	279	19	29	31	10	3	3	0	2	0	0	0	1	
	Chicken feathers	321	25	19	10	2									
1981	Control	282	55	37	20	3									
	Orris Powder	263	49	47	23	13	2								
	Staph aureaus	294	32	41	26	4									
	Egg (white)														

to house dust. In the same study she showed that in a second group of patients with rhinitis but with or without clinical sensitivity to dust, 37.7 percent were positive to house dust mite extract.

Most people are allergic to one kind of seafood or another. In this study we found that 23.92 percent of our subjects were allergic to the shrimp extract. Whole egg appeared to be more allergenic (17.7 percent) than egg white (7.56 percent) because it contains more varieties of proteins and amino acids than egg white.

Cat fur and dog fur produced a 12.77 percent and 10.72 percent skin positivity reaction respectively and this is quite consistent with the finding of Holopainen¹² who found that animal danders were responsible for 13 - 18 percent of allergic rhinitis in Scandinavian countries.

The cockroach allergen belong to the low allergenic group in our study. However there are a few reports which show it as an important cause of asthma. In the Durban area where the house dust mite was the main offender, 9 out of 30 patients showed a significant reaction to cockroach antigen.¹³ This is further supported by a report suggesting that the cockroach antigen may be as important as the mite in house dust allergy in the Kansas City population.¹⁴

Only 5.38 percent of our patients showed a positive reaction to *Aspergillus fumigatus*. The other allergens which showed a relatively low positive skin reaction are to those of *Staphylococcus aureaus* (3.53 percent) and chicken feathers (3.18 percent).

Although 14 allergens were used only about 10

gave a positive response of noticeable frequency. This is an important finding with respect to future skin testing. The 'low' allergenic extracts can be omitted and other more incriminating allergens used.

From Table II & III it is found that almost all the skin reactions to the 14 allergens show a unimodal distribution in terms of weal sizes. This is important since some commercial extracts such as pollens have been shown to have a bimodal skin reaction pattern because of the presence of more than one allergen in a given extract.¹⁵

The allergen extracts used are commercially prepared from the temperate countries. The materials used are different from the local scene; eg. the heterogenous composition of house dust make it difficult to determine the potent allergenic factor.¹² House dust varies not only from country to country but also from house to house. To date house dust extract is being produced by at least four manufacturers.

As a rule allergen extracts lack proper immunochemical standardization and they may be weak or varying in their allergen contents. For any given allergen the extract not only contains varying amounts of allergen from batch to batch but also from bottle to bottle.

Hillas¹⁶ showed that there is a variation in potency of allergens supplied by 3 commercial suppliers. In this study, 18 subjects with clinical sensitivity to house dust had positive reactions to only 2 of the house dust mite extracts and no reaction to the third. This is further supported by Tovey¹⁷ who showed that in 4 commercially

prepared extracts and one laboratory prepared extract, the quantity of allergen varies from 1.5, 52, 108, 265 and 581 arbitrary allergen/ml using the direct binding assay.

There is also the question of false negative skin prick test results. Patients with allergic rhinitis who had a clinical history of house dust mite allergy but negative skin tests with *Dermatophagoides pteronyssinus* were shown not to have specific IgE antibodies in their serum but had specific antibodies in their nasal secretions.¹⁸ Another factor which plays an important role in skin sensitivity tests is that sexes react differently to a given allergen. 708 adolescents in Finland were skin tested by using 12 common allergens from 2 manufacturers and the results showed that the boys were more reactive than girls.⁵

There is a trend to shortlist the number of allergens in skin tests. One allergist is of the opinion that only 4 extracts need be used, i.e. house dust, house dust mite (*D. farinae*), grass pollens and a control.¹⁹ Van Asperen²⁰ from Australia concludes that only 3 allergens need be used i.e. *Dermatophagoides pteronyssinus*, cat fur and rye grass. In our study the 3 important allergens were *Dermatophagoides pteronyssinus*, house dust and shrimp but since this is a preliminary study we do not recommend any such shortlisting yet.

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