

# PRICK SKIN TESTS IN BRONCHIAL ASTHMA AND THEIR CORRELATION WITH THE SPECIFIC SERUM IgE LEVELS

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## SYNOPSIS

100 unselected adult asthmatics were prick tested for allergy to housedust mite, *Dermatophagoides pteronyssinus*. 71% of them were positive compared with only 12% of the controls. Among the 100 patients studied, there were 79 patients with early onset asthma and 21 patients with late onset asthma (after 40 years old). The incidence of positive reaction among the patients with early onset asthma was 79% which was higher than the 43% among the patients with late onset asthma.

54 of the above 100 asthmatics were later prick tested against 21 common allergens. Positive prick test reactions were most commonly seen to housedust mite, *D. pteronyssinus* (65%), housedust (52%), feathers (35%), human hair (17%), cotton flock (5.5%), shrub pollens (5.5%) and *aspergillus fumigatus* (5.5%).

Serum estimation for specific IgE for house dust mite was performed on 18 patients randomly selected of the 100 patients. This was carried out by the radioallergosorbent test on 10 ml of serum and semiquantitative values estimated. Out of the 18 cases whose blood was measured for specific IgE, 12 had positive skin tests, but 11 of them had detectable values of specific IgE against housedust mite. There is good correlation.

## Introduction

The importance of the housedust mite as a cause of bronchial asthma was first reported by Kern (1921) and Cooke (1922). Though the distribution of housedust mite is worldwide, no attempt has so far been made to determine its role as a cause of asthma among the adult asthmatics in Singapore.

The purpose of this study is to determine the

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incidence of housedust mite allergy in adult asthmatics by means of skin tests and the pattern of response to common environmental allergens. The correlation between prick skin test and the amount of circulating specific IgE was also examined.

**Patients and Methods**

100 patients with bronchial asthma seen at the Singapore General Hospital were selected randomly for skin testing against house dust mite. The diagnosis of bronchial asthma was made on the basis of spirometrically variable airway obstruction. 79 patients had early onset asthma and 21 had late onset asthma, i.e. onset later than 40 years.

Their ages ranged from 10 to 73. 33 were female and 67 male. Ethnically they were made up of 71 Chinese, 12 Malays, 17 Indians.

50 controls matched for age were selected from the outpatients in whom there is no clinical evidence of allergy such as eczema, rhinitis, asthma.

Out of the 100 asthmatic patients, 54 were retested subsequently with house dust mite and 20 other common allergens.

All solutions of allergens were from Bencard. The 20 allergens were selected on the basis of their 'likelihood' of being present commonly in the local situation, and were similar to the range used by Pepys et al (1975). Table 1.

Prior to being skin tested, the subjects were permitted to continue taking maintenance bronchodilators and steroids but were instructed to refrain from any antihistamines for at least 24 hours before the test.

The prick test was used throughout, being superior

**TABLE 1: Allergens for Skin Testing**

CONTROL	
<b>Inhallants</b>	<b>Pollens</b>
D Pteronyssinus	Grass Pollens
House Dust	Shrub Pollens
Feathers	Tree Pollens
Cat Fur	Plantain Pollens
Dog Hair	<b>Moulds</b>
Sheep Wool	Moulds A12
Human Hair	Moulds M5
Cotton Flock	Moulds M10
Kapok	Moulds M11
<b>Food</b>	Aspergillus
Milk	Fumigatus
Wheat	
Egg	

to the intrademical test (Pepys) 1968, McAllen & Mansell (1970), Stenius et al (1971). The volar aspect of the forearm was chosen. Sites were marked out with a washable marker at distances of 2 cm. apart in three longitudinal rows 2cm. across. A drop of the test agent was applied to the skin and a specially supplied lancelet was used to depress the skin, to just enter it and then lifted without drawing blood. If blood was drawn, the test was repeated, though little difference was noted between the size of the reactions in the two instances. Reading of the size of the weal and flare were taken exactly 10 min. later. The patients were observed for at least an hour from the time of the test to detect any untoward side effect. The rest was taken as positive if the weal size was at least 2 mm. above control. The flare was disregard because of the difficulty in assessing the extent in pigmented skin.

Serum estimation for specific IgE for housedust mite was performed on 18 patients, randomly selected of the 100 patients. This was carried out by the radioallergosorbent test on 10 ml of serum using the solid phase antigen-antibody systems based on wide et al, 1971.

**Results**

Out of 100 asthmatics tested with housedust mite, 71 patients gave positive reactions, of 50 controls only 6 gave a positive skin test. The difference is statistically very significant. (Table 2). The incidence of positive reaction among the early onset asthmatics was 79% compared with 43% with late onset asthma.

The response in 54 patients to 21 common allergens again showed that positive skin tests were most common to house dust mite (65%), house dust (52%), feathers (35%) human hair (17%) cotton flock (5.5%) shrub pollens (5.5%), Aspergillus fumigatus (5.5%). All patients who respond positively to 1 or more allergens also react to house dust mite. (Table 3)

Out of the 18 cases whose blood was measured for specific IgE against house dust mite, 12 had positive skin tests, but 11 of them had detectable values of specific IgE against house dust mite. (Table 4) There is

**TABLE 2: Prick Skin Test Results to House Dust Mite in 100 Asthmatics**

Patients	No. of +VE Reactions	No. of -VE Reactions	Total
Asthmatics	71	29	100
Control	6	44	50
Total	77	73	150

$x^2 = 46.5; d.f = 1; p < 0.001$

TABLE 3: Skin Test Result to 21 Common Allergens in 54 Asthmatics

Allergens	No. of Pos. Reactions	Allergens	No. of Pos. Reactions
D. Pteronyssinus	35 (65%)	Sheep Wool	2 (3%)
House Dust	28 (52%)	Kapok	1 (1.8%)
Feathers	19 (35%)	Plantain Pollens	1 (1.8%)
Human Hair	9 (17%)	Milk	1 (1.8%)
Cotton Flock	3 (5.5%)	Grass Pollens	0
Shrub Pollens	3 (5.5%)	Moulds	0
Aspergillus F.	3 (5.5%)	Moulds M5	0
Tree Pollens	2 (3%)	Moulds M10	0
Cat Fur	2 (3%)	Moulds M11	0
Dog Hair	2 (3%)	Wheat	0
		Egg	0

TABLE 4: Results of R.A.S.T. To D Pteronyssinus

Total No. Tested	18
No. +VE Skin Test	12 (67%)
No. +VE IgE	11 (67%)

good correlation. All patients who have positive skin tests and positive specific IgE show weal sizes measuring at least 5 mm or more above control. The sole positive skin reactor with no detectable specific IgE, has a weal size of only 4 mm above control. (Fig. 1)

### Discussion

The ubiquity of the house dust mite has been stressed in previous reports (Voonhorst et al 1967, Mansell et al 1968, Brown & Filer 1968, Pepys et al 1968). In our study on 54 patients, 28 out of 37 patients with positive skin tests, have a family or personal history of allergy but only 2 out of 17 patients with negative skin tests have an allergic history. The significantly larger proportion of our patients with positive skin tests compared with controls and the good correlation between skin tests and allergic history confirm the important role of house dust mite in bronchial asthma all over the world including Singapore.

The incidence of positive skin tests in the group classified as of late onset, 43%, is surprising higher than other reported studies. Probable explanations for this would be that some cases may actually have early onset asthma with a short duration of symptoms in childhood that is forgotten or they may fall into the mixed group.

SKIN TEST TO HDM COMPARED WITH SPECIFIC IGE

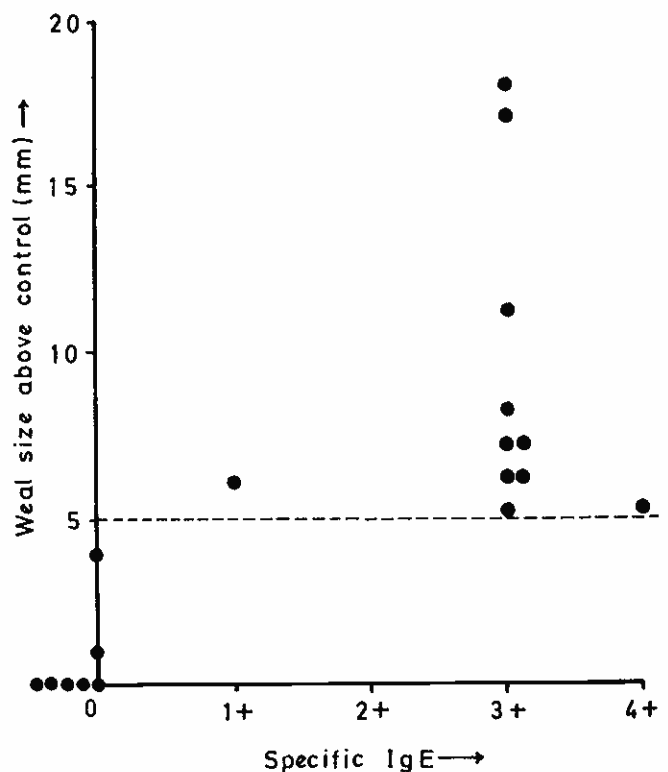


Fig. 1. Weal size of the skin reaction to housedust mite (HDM) compared with serum level of specific IgE in 11 patients.

Several interesting features arose from the study. Although 21 allergens were used, only 14 allergens gave a positive response and only 4 to any noticeable frequency. Probably if extracts of local allergens could be employed the pattern would have been quite different. The low frequency of reaction to the pollens and moulds used would almost certainly be due to regional variation in the types of pollen and moulds.

The observations that 4 allergens produce a response to any noticeable frequency and that all patients who respond to one or more allergens also respond to house dust mite, may aid in determining the minimal number of allergens that could be used in routine testing. These findings suggest that house dust mite and a control are sufficient to detect all positive responders to skin testing, though other reports (McCarthy, 1973, Russell, 1976) found that a minimum of 4 allergens are required.

The result of the IgE estimation correlate with the skin tests in that it is measurable only in positive skin responders. There is no correlation between the weal size and specific IgE concentration. This is not surprising as the method used for IgE estimations is only semi-quantitative. This agrees with the observation that 10% of prick tests reactions do not give a positive R.A.S.T. (Pepys 1975). However, the results suggest that skin testing may be a more sensitive indicator of the atopic state.

We have concluded from this study that all patients

with asthma be skin-tested with house dust mite and a control to establish the atopic status. Further testing with selected allergens can then be made to identify the relevant provoking allergens. The R.A.S.T. measurement of specific IgE is reserved for those with a suggestive history but negative skin tests and those who are taking drugs that interfere with the skin tests.

#### REFERENCES:

1. Brown, H M, Filer, J L.: Role of mites in allergy to house dust. *Brit. Med. J.*, 3, 646, 1968.
2. Cooke, R A, J. *Immunol.*, 7, 147, 1922.
3. Kerne, A. *Med. Clin. N. Amer.* 5, 751, 1921.
4. MaAllen, M K, Mansell, K.: House dust mite asthma. Results of challenge test on five centres with dermatographic patients. *Brit. Med. J.*, 2, 501, 1970.
5. McCarthy, O R.: Selection of skin tests in Asthma. *Brit. J. Dis. Chest*, 67, 238, 1973.
6. Pepys, J, Chan, M, Hargreave, F E.: Mites and house dust allergy. *LANCET* 1, 1270, 1968.
7. Pepys, J, Hamick, D J, Davies, R J, D'Souza, M F. An analysis of skin prick test reactions in 656 asthmatic patients. *Thorax* 30, 2, 1975.
8. Russell, G, Jones, S P. Selection of skin tests in childhood asthma. *Brit. J. Dis. Chest*, 70, 104, 1976.
9. Stenius et al. *Clinical Allergy*, 1, 37, 1971.
10. Voorhorst et al. The house dust mite and the allergens it produces. Identify with house dust allergens. *Journal of Allergy*, 39, 329, 1967.
11. Wide, L et al. Solid phase antigen antibody systems. Chap. In *Radioimmunoassay Methods*. Ed. by Kirham, K E and Hunter W M, Livingstone, Edinburgh, 1971.