

**THE MAIN CULPRIT IN ALLERGIC RHINITIS-HOUSE DUST OR HOUSE DUST MITE**Abhey Sood<sup>1</sup>**HOW TO CITE THIS ARTICLE:**

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**ABSTRACT:** Allergic rhinitis especially perennial type makes life miserable for the patient. House dust mite is one of the major players causing it. This study is to compare the allergen in city of house dust mite versus house dust and evaluate any cross-allergenicity between them. **STUDY DESIGN:** Prospective study in a tertiary referral hospital. **MATERIALS & METHODS:** Forty patients of allergic rhinitis and well matched controls were subjected to intradermal skin tests to house dust and house dust mite allergen. The skin tests were graded as per standard norms and the responses matched after correlating with different parameters. Statistical analysis was done and the results evaluated. **RESULTS:** House dust mite was the main allergen, as compared to house dust, responsible for causing allergic rhinitis. The allergen reactivity potential of house dust mite was significantly more as compared to house dust. And, as such there was no statistically significant cross-allergenicity between the two groups. **CONCLUSION:** House dust mite rather than house dust is the main culprit in causing allergic rhinitis. Hence, precautionary and preventive measures to control the exposure to house dust mite can be undertaken.

**KEYWORDS:** Allergic rhinitis, House dust mite (Dermatophagoides), Skin tests.

**INTRODUCTION:** Allergy is a subject beset with uncertainties and comprises many aspects which are controversial. The fundamental question as to why does a person become allergic is still not clear. Among the whole spectrum of allergic diseases, allergic rhinitis is the most commonly encountered; with an average incidence which rests around ten percent in a given sample community. Nose functions as a filter for the inhaled air; mucous membrane being the site for trapping for the aeroallergens. The various allergens are broadly grouped into pollens, insects, fungi, dusts and dander. Allergic rhinitis is basically classified into seasonal and non-seasonal (perennial) types, with a considerable overlap among the two. The perennial type is due to constant exposure to aeroallergens other than pollens present throughout all seasons of the year. And regards its aetiology, house-dust mite and house-dust have been implicated as the main culprits in many of the studies. The present work was undertaken to compare the allergic potential of the two allergens, house-dust and house-dust mite and to see for any cross-allergenicity among them.

**REVIEW OF LITERATURE:** House dust is the substance most often accused of causing perennial allergic symptoms in the airways; and has been recognized now for about seventy years.<sup>1,2</sup> Of all the allergenic substances, it is by far the most heterogeneous, comprising a hotchpotch of substances of both animal and plant origin.<sup>3</sup> It constitutes different substances such as molds, micro-organisms, feathers, fibres, house dust mite and human and animal

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danders; and this has been excellently reviewed in an article by Berrens<sup>4</sup>. It varies widely in composition and allergenicity, though specimens from many countries contain common or related allergens.

One of the important allergenic components of house dust has been proved to be house dust mite (*Dermatophagoides* sp.). Though early observations were made in regard to this aspect, it was Voorhost et al.,<sup>5</sup> in 1964, who finally launched this theory. This cross-allergenicity was further supported by Voorhost et al.,<sup>6</sup>; Pepys et al.,<sup>7</sup>; Frankland et al.,<sup>8</sup> and Billioti et al.,<sup>9</sup> In contrast, Kawai et al.<sup>10</sup> and Stenius and Wide<sup>11</sup> contested the above conclusions on the grounds that there was no significant correlation between reactions to house dust extract and mite extract. Other determinants were suggested for this non-interaction and included cotton linters,<sup>12</sup> human dander, animal epithelium and a variety of miscellaneous substances.<sup>13</sup>

In an excellent review by Maunsell et al.,<sup>14</sup> the mite was found in highest numbers on the bedding, slightly lower on the bedroom floors and in lowest numbers on the living room floor. The allergenic properties of mite are present in both live and dead mites, as well as in their faecal pellets, and probably also in their secretions. The mites prefer to live undisturbed in humid surroundings and this is why they are numerous in damp, inadequately heated houses.<sup>15</sup> House dust mites grow well in a humid climate - this can be in well isolated dwellings or in the tropical climate - and nourish from human skin dander. Scales are found in mattresses, upholstered furniture and carpets.<sup>16</sup>

**MATERIALS AND METHODS:** Forty patients of purely allergic rhinitis and forty controls were included in the study done in the ENT Department of IGMC Shimla, Himachal Pradesh. The patients were selected on the basis of a detailed history and clinical examination favoring the diagnosis of allergic rhinitis. They were from 'in and around' vicinity of Shimla town, free from any other chronic disease and not on any antihistaminics and / or on immunotherapy treatment. Then the controls were well-matched for age and sex, having no history of allergy and were residents of the same geographical region.

The skin tests with both the allergens were carried out, in a single sitting, by intradermal method on the volar aspect of the forearms, 4 – 5 cm apart, after proper sterilization. 0.01 ml of antigen / allergen was injected using a 26 no. short bevelled needle and a tuberculin syringe, forming a wheal of around 3mm and was marked with a ball pen point. A negative (phosphate buffer saline) and a positive control (histamine) were used.

The tests were read at 15 minutes, the readings being taken as an average of the largest and the perpendicular diameters. They were graded on the basis of the following scale (Table 1).<sup>17</sup> 2+ and > were taken as significant. Histamine reaction was taken as 2+; any variation was graded accordingly. The patient was observed for at least half an hour after the test for any untoward incident.

**RESULTS:** The average mean age of the study population was 28.02±1.39 years with overall sex distribution not very significant with 55% females as compared to 45% males. The distribution of type of nasal allergy was not much varied, each showing almost comparable number of cases [Seasonal 13(32.5%); Perennial 14(35%) and seasonally exacerbated 10(25%)]. 3 cases (7.5%) were not classified because duration of disease was less than 1 year in these cases.

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History-wise, house-dust came as the most common offending agent in 23 cases (57.5%) for causing allergic rhinitis. Correlation of presence of history of allergy to house dust and type of allergy was done (Table 2).

The reactivity of individual allergens was calculated; first by tabulating the wheals and flares of all the positive reactions of an allergen and finding the average; and then dividing this average, after multiplying with number of positive cases by total number of cases tested i.e. 40 (Table 3). House dust mite was found to be far more reactive of the two.

Correlation of history of allergy to house dust with skin reactions to house dust mite extract and house dust extract was done. When Chi-square test with Yates' correction for homogeneity was applied for house dust mite extract,  $p$  was  $< 0.001$ . Overall, about 87% of the cases with positive history of allergy to house dust showed positive reactions to house dust mite extract (Table 4).

Both the allergens were compared for cross-allergenicity i.e. correlation between skin reactions to house dust mite extract and house dust extract was done. No correlation was seen as such (Table 5).

**DISCUSSION:** A carefully taken history, in particular, should be directed towards finding the allergen which is responsible for the symptoms of allergic rhinitis. This is supplemented by various special investigations to arrive at a conclusive diagnosis. The present study was to evaluate the two important alleged allergens for causing perennial allergic rhinitis and see for any significant cross allergenicity among them.

The most common allergen history-wise in this study was house dust. And this sensitivity to house dust was significantly seen more in perennial type of nasal allergy (Table 2), this being all-the-year-around present allergen. The house dust mite was found to be mostly responsible for the causation of the disease (Table 3) and has also been implicated worldwide in various studies<sup>18,19</sup> as the major offending allergen.

When history of allergy to house dust was correlated with skin tests to house dust mite extract and house dust extract, significant correlation was seen with the former whereas the house dust extract showed no such relationship (Table 4). The reason for this may be that the house dust extract used in the study did not have house dust mite as its component. When correlation between skin reactions to house dust mite extract and house dust extract was done (Table 5), no significance was seen. The cross-allergenicity between house dust and house dust mite has been supported by the works of Voorhorst et al.,<sup>6</sup> Pepys et al.<sup>7</sup> and Biliotti et al.,<sup>9</sup> On the contrary, Kawai et al.<sup>10</sup> and Stenius and Wide<sup>11</sup> contested the above claims and reported that there was no significant correlation between reactions to house dust extract and mite extract. Overall house dust being of multifactorial and varied composition,<sup>4</sup> this discrepancy can be explained.

**CONCLUSION:** History-wise, house dust was mostly responsible for causing allergic rhinitis. On skin testing, house dust mite was found to be the most important allergen in the causation of the disease with more allergenicity. The house dust mite rather than house dust as such is responsible for allergic response and therefore necessary measures to control the mite menace should be undertaken. National and international guidelines for the management of allergic

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rhinitis recommend that house dust mite avoidance measures be considered in all patients with house dust mite-provoked rhinitis.<sup>20</sup>

Grade	Size of wheal	Size of erythema	Pseudopodia
0	Same as buffer saline	Same as buffer saline	None
1+	2.5 times or > than negative control but not <6mm	10 – 20 mm	None
2+	3 times or > than negative control	20 – 30 mm	None
3+	4 times or > than negative control	> 30 mm	1 – 2 small
4+	4 – 6 times negative control	> 35 mm	Several

Table 1: Grading of Intradermal Skin Tests

History of allergy to house dust	Seasonal	Perennial	Seasonally exacerbated	Total
Absent	10	03	02	15
Present	03	11	08	22
<b>Total</b>	<b>13</b>	<b>14</b>	<b>10</b>	<b>37</b>

Table 2: Correlation of Allergy to House dust & Disease type

When chi-square test for homogeneity was applied,  $p < 0.01$ .

Name of allergen	No. 2+ reaction	No. 3+ reaction	No. 4+ reaction	Total + reaction	Pseudo-podia	Av. Wheal Dia. (mm)	Av. Flare diameter (mm)	Av. Reactivity (wheal)	Av. Reactivity (flare)
House dust	02	03	00	05	03	18.6	41.9	2.33	5.24
House Dust Mite	07	12	04	23	12	16.6	37.8	9.55	21.73

Table 3: Allergen Reactivity Comparison

Skin Tests				
History of Allergy to House dust	To house dust mite Extract		To house dust Extract	
	Positive	Negative	Positive	Negative
Positive	20 (86.96%)	03 (13.06%)	04 (17.39%)	19 (82.61%)
Negative	03 (17.65%)	14 (82.35%)	01 (05.88%)	16 (94.12%)
	$p < 0.001$		$p > 0.05$ (not significant)	

Table 4: History of Allergy (House Dust) Vs. Skin Tests

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Skin Reactions to House Dust Extract	Skin Reactions to House Dust Mite Extract	
	Positive	Negative
Positive	05	00
Negative	18	17

**Table 5: Skin Reactions to House Dust Vs House Dust Mite Extract**

p >0.05

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