Ambient Exposure To Specific Allergenic Components

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ABSTRACT

There is a high prevalence and density of Blomia tropicalis (BT) in local homes and a large number of allergic patients sensitised to dust mite allergens in Singapore. This study aimed to evaluate the prevalence and distribution of three BT allergens (Blo t 1, Blo t 4 and Blo t 5) and a Dermatophagoides farinae (DF) non allergenic protein (NA) in 474 dust samples obtained from local domestic dust via quantification of the allergen levels in dust samples by Enzyme Linked Immunosorbent Assay (ELISA). There is a general observed prevalence pattern among the allergens studied with highest abundance in beds. Results show the presence of high level of Blo t 1 and very low levels of Blo t 4, Blo t 5 and DF NA. This indicates the use of Blo t 1 as a gauge to the levels other BT allergens present in local house dust. In addition, the use of different extraction methods resulted in observed variations of DF NA and DF allergens level in the DF mite extracts indicates that appropriate extraction methods in sample processing is an important consideration of the evaluation of various allergen levels in dust.

INTRODUCTION

There is a high prevalence and density of Blomia tropicalis (BT) in local homes and a large number of allergic patients sensitised to dust mite allergens in Singapore. The allergens to be studied belong to BT group 1, 4 and 5, namely, Blo t 1, Blo t 4 and Blo t 5 and a Dermatophagoides farinae (DF) non allergenic protein (NA) were chosen for this study with respect to the prevalence of allergenic potency. Quantification of Blo t 1, Blo t 4, Blo t 5 and NA will allow us to evaluate the prevalence and distribution of their presence in local homes such that the relationship between exposure and sensitization in local context can be investigated. This knowledge obtained will lead us to construct methods for allergen avoidance, thus facilitating the control of mite allergy.

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MATERIALS AND METHODS

Blo t 1, Blo t 4, Blo t 5 and DF NA antibodies were raised by immunisation of rabbits with recombinant proteins and quantification of the allergen levels in dust samples by Enzyme Linked Immunosorbent Assay (ELISA). Randomly selected local homes were subjected to various allergen avoidance treatments, which include the use of the acaricide, D’Allergen, mattresses fitted with Allergy Control Covers™ (ACC) and High Efficiency Particulate Filters (HEPA) in bedrooms. Dust samples of the aforementioned studies were collected from beddings, sofas and carpets, 1, 2 and 4 months after the treatments. Some of these samples were used in the current study to compare the Blo t 1 level in the house before and after the treatment for the evaluation of the treatments on specific allergen level. Total protein was extracted from BT, DF and DP cultures were both ground and unground in PBS and in addition, DF total protein was also extracted via TCA (trichloroacetic) in acetone.

RESULTS

Distribution and Levels of House Dust Mites Allergen Measured by ELISA
Blo t 1 is the most prevalent in Singapore residential homes. In this study, only those dust samples with >0.2 ìg/g of Blo t 1 were used for the determination of Blo t 4, Blo t 5 and NA levels, and it was observed that the level of the other three allergens were very low in house dust as compared to Blo t 1. Within the microhabitat in homes, house dust allergen was found to be highly concentrated in mattresses, as observed with the highest level of Blo t 1 found in this material (Geometric mean = 1.26ìg/g) with up to 25.5% of dust samples having threshold levels for sensitization (>2.0ìg/g). Carpets ranked second (Geometric mean = 0.84ìg/g) with 18.8% >2.0ìg/g. Blo t 1 was found in low levels in kitchen floors (Geometric mean = 0.29ìg/g) and sofas (Geometric mean = 0.48ìg/g), ranging from 1 to 2.8%. that attained threshold level of sensitization. Levels of Blo t 4, Blo t 5 and DF NA were found to be more prevalent in mattresses as well. This finding supports the use of Blo t 1 level as a gauge for other mite allergens present in house dust.

Effects of the Allergen Level After Treatment
With comparison to the level of Blo t 1 in homes before the treatments, the levels Blo t 1 in the treated homes generally decreased with the most drastic drop observed in bed mattresses. However, the only statistically significant decrease as determined by a Chi-square test was obtained for the mattresses (p<0.05)

Variation of Allergen Levels in Different DF Extracts.
The use of different extraction methods resulted in observed variations of DF NA and DF allergens level in the DF mite extracts.
DISCUSSION

The high prevalence and density of BT in local homes and the high number of allergic patients sensitised to dust mite allergens creates a need to investigate the prevalence and distribution of its allergens. This project hence constitutes a pilot study which involves the BT allergen in house dust. Quantification of the allergen levels in local domestic dust shows the presence of high level of Blo t 1 and very low level of Blo t 4, Blo t 5 and DF NA. This data thus supports the use of Blo t 1 as a gauge of BT levels in dust. Discrepancies in the results obtained are due to the extraction methods used. Therefore, the method for dust collection and sample processing utilised is not an appropriate methods to provide a good estimate of the allergens present in house dust. Alternative method such as TCA acetone extraction and PBS with grinding would probably be a better representative of the allergen levels in house dust. Study shows treatments for allergen avoidance to be effective in Blo t 1 levels suggest that analysis should be carried out to determine the viability of the treatments in other BT allergens as well.

REFERENCES


