Correlation between skin tests to *Dermatophagoides pteronyssinus*, *Dermatophagoides siboney* and *Blomia tropicalis* in Cuban asthmatics

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ABSTRACT

Background: Dermatophagoides pteronyssinus, *Dermatophagoides siboney* and *Blomia tropicalis* are the most important allergenic mites in Cuba. The aim of this study was to determine the degree of polysensitization and correlation of the skin prick test (SPT) reaction size to these mites in asthmatic patients.

Methods: A total of 232 adult patients with asthmatic symptoms caused by house dust and positive SPT to at least one mite were included. Standardized allergenic extracts were used in SPT.

Results: A total of 88.4 % of patients were positive to *D. siboney*, 87.1 % to *D. pteronyssinus*, and 68.1 % to *B. tropicalis*. Sensitization to *Dermatophagoides* species was predominant, demonstrated by the fact that 31.9 % of patients showed positive SPT to either *D. siboney* or *D. pteronyssinus* only, whereas only 5.6 % was sensitized solely to *B. tropicalis*. Nevertheless, most patients (58.6 %) were polysensitized to the 3 species. The mean wheal size produced by the different allergens in positive patients was similar (n.s. $p > 0.05$). Reaction size was strongly correlated ($r = 0.71$, $p = 5.3 \times 10^{-09}$) between *D. siboney* and *D. pteronyssinus*, whereas no significant correlation was found between *D. pteronyssinus* or *D. siboney* and *B. tropicalis*.

Conclusions: The results of this study support the need to include the 3 allergens in diagnostic panels and for combined allergen-specific immunotherapy.

Key words: Skin prick test. Correlation. Polysensitization. Domestic mites.

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INTRODUCTION

The prevalence of Allergy is achieving epidemical proportions all over the world[1]. In Cuba, it is estimated that about 20 % of the population is allergic. According to different sources from 5.7 % to 10 % of the total population suffer from asthma[2,3], with a highest prevalence among teenagers, reaching 17.8 %[4]. The increase of prevalence of allergic diseases is commonly associated with changes in lifestyle and environment. Particularly, allergic asthma is strongly associated with IgE sensitization to House Dust Mites[5]. Previous studies have described 3 domestic mite species as the most relevant in Cuba regarding allergic sensitization: *Dermatophagoides pteronyssinus* (*Dp*), *Dermatophagoides siboney* (*Ds*) and *Blomia tropicalis* (*Bt*)[6].

Dermatophagoides species are well known all over the world as important inhalant allergen sources. *D. siboney* is a local endemic specie reported first in 1984[7] and is closely related to *D. farinae*, which is not found in Cuba. On the other hand, *Blomia tropicalis* is very common in tropical humid and hot climates. In general, tropical conditions with high temperatures and humidity all over the year favor the growth of domestic mites, and presumably, are decisive for the dominant role of mite allergens over the rest of inhalant allergens in our population[6].

Prevalence of sensitization to *Dp* and *Ds* in Cuban asthmatic population have been reported previously ranging from 70 to 85 % by a few authors[6,8,9]. Considerably less data is known about sensitization to *Bt*, although prevalence rates of up to 79 % have been reported[6,10]. Particularly, in this work we address the question about the degree of poly-sensitization and correlation of the skin response to these mite species, in a relatively large population of adult asthmatic patients, in the Havana urban region. Provided that, the cross-reactivity between *Dermatophagoides* and *Blomia tropicalis* is very limited, the study of the simultaneous sensitization, both in terms of prevalence and intensity, is of great importance for defining an etiological approach to manage the disease, based on prevention and allergen-specific immunotherapy.

MATERIALS AND METHODS

A multicenter, transversal, descriptive and analytical study was performed on 232 adult patients, who attended Allergy Services at two Havana University Hospitals: "Calixto Garcia" and "Joaquín Albarrán", from October, 2004 to March, 2005. Patient's mean age was 30.3 years (SD = 8.7); 92 were men and 140, women. The inclusion criteria were the presence of a clinical history of respiratory allergy to house dust (asthma with or without rhinitis) and a positive Skin-Prick-Test to at least one mite species. Written informed consent was given by every patient included in this study in agreement with Good Clinical Practice.

Skin Prick Test

Skin Prick Test (SPT) was performed on all patients following the method described by Dreborg[11]. Briefly, a drop of the allergen solution was applied on to the forearm of the patient. The lancet (ALK, Denmark) was pressed slightly at 90° angle into the skin, during 1 second. After 15 min. the wheal contour was outlined using a pen and transferred to an adhesive tape. The wheal maximum (d_m) and orthogonal (d_o) diameters were measured and mean diameter was calculated as $d = (d_m + d_o)/2$. The test was considered valid when the skin reaction to the negative control (Buffer Solution) was smaller than 3 mm, and for the positive control (Histamine HCl, 10 mg/mL), greater than 3 mm. The test result was regarded positive if the wheal diameter was greater or equal to 3 mm. The wheal area was calculated according to the expression: $A = \pi \cdot d^2/4$. The following standardized allergen extracts, manufactured by BIOCEN, Cuba, were used for prick testing:

VALERGEN-DP *Dermatophagoides pteronyssinus*
VALERGEN-DS *Dermatophagoides siboney*
VALERGEN-BT *Blomia tropicalis*

The extracts are stardandized in Biological Units (BU) acording to the definition of Nordic Guidelines for Registration of Allergen Products[12]. The used concentration was 20 000 BU/mL, following manufacturer instructions.

Statiscal methods

Wheal area data was log-transformed and tested for normality using the Kolmogorov-Smirnov test ($\alpha = 0.05$). Geometric means and 95 % Confidence Intervals were employed for comparing the reaction size between different allergens. The correlation of SPT size was calculated using the non-parametric Spearman rank correlation coefficient. Statistical processing was performed using STATISTICA v5.1 software package (StatSoft, USA).

RESULTS

The highest prevalence of positive test was observed to *D. siboney* (88.4 %) and *D. pteronyssinus* (87.1 %), followed by 68.1 % to *B. tropicalis* (table I).

Table I

Positive SPT results to different allergens and allergen combinations (n = 232)

	n	%
D. siboney	205	88.4
D. pteronyssinus	202	87.1
B. tropicalis	158	68.1
D. pteronyssinus or *D. siboney*	219	94.4
Only to *D. pteronyssinus* or *D. siboney*	74	31.9
D. pteronyssinus and *D. siboney*	188	81.0
Only to *B. tropicalis*	13	5.6
Positive to all three allergens	136	58.6

Table II

Geometric mean of the reaction size (Wheel area, mm²) to different allergens and Histamine, in patients with positive SPT results

Wheel area (mm²)	*D. siboney*	*D. pteronyssinus*	*B. tropicalis*	Histamine HCl
Geometric Mean	22.2	21.6	19.4	24.8
95 % Confidence Interval	19.8-24.6	19.3-23.9	16.7-22.1	23.3-26.3

Most *Dermatophagoides* positive patients showed positive results to both species simultaneously (81.6 % of the total number of tested patients), whereas, up to 94.4 % were positive either to *Dp* or *Ds* or both; i.e. only 12.8 % (the difference) showed a specie specific response within *Dermatophagoides* genus.

The predominant role of sensitization to *Dermatophagoides* as compared to *Blomia tropicalis* is evidenced by the fact that 31.9 % of patients were exclusively positive to *Dp* or/and *Ds* whereas only 5.6 % were positive solely to *Bt*. Nevertheless, most patients (58.6 %) were sensitized against the three mite allergens, simultaneously.

The largest reactions were observed to *D. siboney* and *D. pteronyssinus*, followed by *B. tropicalis,* in full agreement with the prevalence data (table II). Nevertheless, the difference was not significant ($p < 0.05$). On the other hand, a highly significant Spearman correlation coefficient ($r = 0.71$, $p = 5.3 \times 10^{-09}$) was found between SPT reaction size to *Dp* and *Ds*, whereas no significant correlation was reported between *Bt* and neither *Dp* nor *Ds*.

DISCUSSION

High prevalence of sensitization to *D. siboney*, *D. pteronyssinus* and *Blomia tropicalis* among Cuban asthmatic patients has been reported previously[6,8-10], and our results are in full agreement with that. All these species are commonly found in house settings in Havana geographical area[6]. However, in our work, a slightly decreased prevalence of sensitization was found in the case of *Blomia tropicalis* as compared to *Dermatophagoides*. In other geographical areas with similar climatic conditions (for instance, Caribbean islands, Caribbean cost of Colombia, Central America, Brasil, Southeast Asia), sensitization to *Bt* in asthmatic patients is also very relevant, ranging from to 40 to 80 %[13-17]. The observed reaction sizes were similar to the values reported previously by different authors[6,8,18].

According to our results, most patients (58.6 %) are poly-sensitized to *Ds*, *Dp* and *Bt*. Coincidence of positive SPT and significant correlation of reaction size between *Dp* and *Ds*, can be caused by the extensive IgE cross-reactivity described for these two species[19]. In contrast, only limited IgE crossreactivity has been reported between *Bt* and *Dermatophagoides* species[19-21], suggesting that, in that case, polysensitization should be provoked by simultaneous exposure to different species, that possibly share a common environment; which is supported also by the lack of correlation concerning reaction size. Also, the genetic background of the population could also influence the intensity of the response to different allergens, leading to the lack of correlation regarding reaction size between *Bt* and *Ds* or *Dp*, even if the degree of exposure were the same. Other authors in the Caribbean geographical area have also reported lack of correlation between skin test to *Dp* and *Bt*[16].

Overall, the results of our study highlight the relevance of domestic mites as sensitized agents, strongly associated with asthma symptoms in our population, with a predominant role of *D. siboney* and *D. pteronyssinus*, but also, with a significant contribution of *B. tropicalis*. This work support the necessity of including allergens of these 3 mite species in routine skin test panels, for achieving higher diagnostic performance. In addition, the high degree of poly-sensitization should be taken into account for the effective administration of allergen-specific immunotherapy.

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