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Healthy Adults Demonstrate Less Skin Reactivity to Commercial Extracts of Commonly Ingested Food than to *D. farinae*

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SUMMARY **The aim of this study is to determine the skin reactivity of healthy Oriental adults to commercial extracts of commonly ingested food and the house dust mite *D. farinae*, a common local aeroallergen. *D. farinae* and 18 food extracts were skin prick tested on adults without any personal history of atopic diseases and food allergy. The extracts of food not consumed by any subject on religious or personal grounds were not tested for that individual. A total of 103 healthy adults who fulfilled the selection criteria were skin prick tested. There were 35 males and 68 females. Their mean age was 29 years (SD ± 7.5) with a range of 19 to 49 years. Sixty-eight percent were Chinese, 12.6% Malay, 12.6% Indian and 6.8% other Oriental races. Fifty-four (52.4%) were positive for *D. farinae* while only 12 (11.7%) were positive for at least one food extract. The food extract that gave the most number of positive reactions was shellfish mix (5/102, 4.9%). A family history of atopy did not have any significant correlation with the results of skin test. It was concluded that healthy adults demonstrate less skin reactivity to extracts of commonly ingested food than to *D. farinae*.**

Skin prick test is widely used for the detection of the presence of specific IgE antibody to a wide variety of naturally occurring inhalant and food allergens. This method of testing is a convenient and relatively inexpensive way of screening for type I hypersensitivity. As is the case for all diagnostic tests, its performance depends on its ability to predict clinical problem. The specificity of the test for various allergenic extracts depends on the prevalence of positive reactions to the extracts in healthy individuals in the population.

The diagnosis of food allergy is based on a combination of history, clinical examination and several tests including initial screening with skin prick test. It had been reported that skin prick test using extracts of egg, peanut, wheat, milk, fish and tree nuts have excellent negative predictive value approaching 100% but a low positive predictive value of less than 60%.[2] This means that a fair number of individuals have positive prick tests without any clinical problem of food allergy.

In Singapore, *D. farinae* is a common local aeroallergen.[3] In our earlier study, we have demonstrated a high prevalence of positive skin test to this allergen in healthy adults without clinical illness.[4] The skin reactivity of local healthy adults to commercial food extracts is not known. We carried out this study to determine the skin reactivity of healthy Oriental adults to commercial extracts of commonly ingested food and compared its reactivity to *D. farinae*. This information would allow us to assess the utility and limitations of these allergenic extracts in our local patients.

MATERIALS AND METHODS

Healthy Oriental adults age 16 years and above were recruited

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for the study after informed consent. A standard questionnaire was used to ascertain that they do not have any personal history of allergic rhinitis, allergic conjunctivitis, asthma, atopic eczema, or food allergy. A family history of atopy was obtained but was not an exclusion criteria if positive.

D. farinae and a panel of 18 extracts (from GREERS Laboratory) comprising of food and a few spices commonly consumed locally were used. These food were: milk, egg, peanut, fish mix, shellfish mix, soy, rice, wheat, pork, beef, lamb, chicken, yeast, celery, cinnamon, garlic, onion, and ginger. Histamine phosphate (1mg/ml of base) was used as positive and diluent as negative control. The subjects were not tested to extracts of food that they do not take because of religious or other personal reasons. Skin prick tests were done on the volar aspect of the forearms of subjects by one of the authors following the usual precautions.[5] A wheal of at least 3 mm mean diameter greater than the negative control was considered positive.

RESULTS

A total of 103 healthy subjects were recruited. Table 1 shows their demographic characteristics. Thirty-five were males and 68 females. Their mean age was 29 years (SD ± 7.5) with a range of 19-49 years. The majority were of ethnic Chinese origin.

Twenty-three subjects gave a family history of allergic rhinitis, asthma and/or atopic eczema. Four subjects have a family history of food allergy (Table 2).

Table 3 shows the skin test reactivity of the subjects to the various extracts. Fifty-four (52.4%) of the subjects showed positive reactions to *D. farinae* while only 12 individuals (11.7%) had positive reactions to at least one food extract. Of these 12 individuals, 10 were positive to only 1 food each, 1 was positive to 2 foods and another person was positive to 4 food extracts. The most commonly positive food was shellfish mix (5/102, 4.9%). Two individuals (n = 102) had positive reaction to fish mix and 2 (n = 99) to chicken.

Although the single individual who was positive to 4 food extracts (shellfish mix, fish mix, chicken and cinnamon) has a family history of asthma and rhinitis, it was found that a family history of allergic rhinitis, asthma or atopic eczema did not have any correlation with skin test positivity to food extracts (p = 0.469 by Fischer's Exact test). Neither was there correlation between skin test positivity to food and the family history of food allergy or atopy (p = 0.3708 by Fischer's Exact test). Only 2 out of 23 individuals (8.7%) with a family history of rhinitis, asthma or eczema had at least 1 positive reaction to food extracts. Ten of the 80 subjects (12.5%) without such a family history had at least 1 positive reaction to food extracts.

Table 1 Demographic characteristics of subjects

Demographics		
Number of subjects		103
Sex	Male	35
	Female	68
Age (years)	Range	19 to 49
	Mean	29 ± 7.5
	Median	27
Race	Chinese	70 (68%)
	Malay	13 (12.6%)
	Indian	13 (12.6%)
	Other Oriental races	7 (6.8%)

Table 2 Family history of allergic rhinitis, allergic conjunctivitis, asthma, eczema and food allergy

Family history	Yes	No	Don't know
Eczema	9	90	4
Rhinitis	12	86	5
Conjunctivitis	0	100	3
Asthma	14	86	3
Food allergy	4	93	6

Table 3 Skin reactivity to *D. farinae* and food extracts

Allergen	Positive	Negative	Not done
D. farinae	54	49	0
Shellfish mix	5	97	1
Chicken	2	97	4
Fish	2	100	1
Yeast	1	102	0
Pork	1	86	16
Beef	1	87	15
Cinnamon	1	102	0
Soy	1	102	0
Garlic	1	102	0
Ginger	1	102	0
Peanut	0	103	0
Milk	0	103	0
Rice	0	103	0
Lamb	0	99	4
Onion	0	103	0
Egg	0	103	0
Wheat	0	103	0
Celery	0	103	0

A family history of atopy also did not correlate with skin test reactivity to *D. farinae* ($p = 0.3951$ by the Fisher's Exact test). Eleven out of twenty-three (47.8%) of the subjects with a family history of atopy and 53.8% (43/80) without a family history of atopy have a positive reaction to *D. farinae*. There was no correlation between skin test positivity for *D. farinae* and skin test positivity for food extracts ($p = 0.085$ by Fischer's Exact test).

Based on these results, the specificity of *D. farinae* extract in the diagnosis of clinical allergy in our population is only 47.6% whilst that of the food extracts vary from 100% to 95.1%.

DISCUSSION

The aims of allergy skin testing are to document the involvement of IgE mediated degranulation of mast cells in causing a disease and to identify the allergen(s) involved. Recommendations of avoidance measures must be based on accurate information that has excellent predictive values. It is known that 30-40% of apparently healthy persons in any population have IgE antibodies to common aeroallergens of the environment.[6]

As expected, the results of our study show that healthy Oriental adults demonstrate positive skin tests to extracts of commonly ingested food and *D. farinae*. More than half of the healthy adults in this study have skin test reactivity to *D. farinae*. This high prevalence of non-clinically significant *D. farinae* specific IgE in our population means that the test has low specificity. A good history and clinical assessment before the test is ordered is thus important. There is a much lower prevalence (11.7%) of clinically none significant positive reactions to commercial extracts of commonly ingested food in our study subjects.

The study by Adinoff *et al.*[7] in adult subjects showed that 46% of those with no personal history of atopy but has family history of asthma or allergic rhinitis had at least one positive skin prick test to 13 extracts (10 pollens, 2 housedust mites and cat). In this same study, 29% of subjects with no personal or family history for asthma or allergic rhinitis had at least 1 positive test. They concluded that asymptomatic subjects whose first degree family members have an atopic disease have a higher rate of positive skin prick test than those without a family history. Our study did not show a correlation between family history of atopy or food allergy and skin test positivity for at least one food allergen. Neither was there a correlation between skin test positivity for *D. farinae* and family history of asthma, rhinitis or eczema.

Our study has shown that the specificity of the commercial extracts for the 18 food selected is high for our population. However we do not know their sensitivity and predictive values. Further studies have to be carried out to assess the true clinical value of these extracts in our population.

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