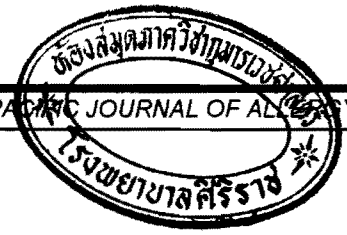

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Evaluation of the MAST CLA Allergy System for Diagnosis of Allergies to House Dust Mites and Cats

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SUMMARY **The MAST CLA system was evaluated against skin prick test (SPT) for diagnosis of allergies to house dust mites (*Dermatophagoides pteronyssinus*, *Dermatophagoides farinae*) and cats. Forty three asthmatic children were examined by SPT and MAST CLA. Chi-square analysis indicated significant association between SPT and MAST CLA results for the house dust mites but not for cats. The sensitivities of MAST CLA for house dust mites and cats were 100 and 25% respectively; specificities were all less than 50%. The efficiency of MAST CLA for detection of allergy to the house dust mites was 88% and 44% for cats. A significant linear correlation was found between SPT wheal size and MAST CLA grade for *D. farinae* but not for *D. pteronyssinus* and cats. It is concluded that the MAST CLA allergy system can be used to supplement SPT for diagnosis of allergies to house dust mites but not to cats.**

Allergies to house dust mites and cats are some of the more important causes of asthma and rhinitis in Malaysia.[1,2] Supplementing clinical examination and case history for diagnosis of allergies, are a number of *in vivo* and *in vitro* techniques. *In vivo* allergy skin tests are accurate and easy to perform. Where skin tests cannot be conducted, *in vitro* methods can be employed. One of these *in vitro* techniques is the MAST CLA system. The basis of the MAST CLA is a chemiluminescent immunoenzymometric system which was first developed in 1985.[3] It is used for the simultaneous measurement of total IgE and specific IgE in human sera to as many as 35 different allergens. The large panel of allergens available in the MAST CLA system enables it to be used for diagnosis of both inhalant and food allergies. The MAST CLA had been compared with another popular *in vitro* assay, the radioallergosorbent test (RAST) and skin tests for the diagnosis of inhalant allergies; it was reported that MAST CLA and RAST gave similar results but both are not as sensitive as skin tests.[4] The MAST CLA was introduced into Malaysia recently. This study was undertaken to evaluate the effectiveness of the MAST CLA for diagnosis of allergies to house dust mites and cats in asthmatic children.

MATERIALS AND METHODS

Subjects

Forty three children with clinically diagnosed asthma were recruited from an Asthma Clinic in the University Hospital, Kuala Lumpur, Malaysia. The children were aged 7 to 15 years and all were tested with skin prick test and MAST CLA.

Skin prick test (SPT)

All patients were informed

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to refrain from taking anti-histamines for at least 48 hours before undergoing the SPT. Commercially available allergens (Bencard, United Kingdom) of *D. pteronyssinus*, *D. farinae* and cat fur were purchased. Histamine and allergen diluent were used as positive and negative controls, respectively. Small drops of the allergens were applied on the forearm of each patient, with a distance of 2 cm between each allergen. A sterile lancet was next used to make a superficial prick in the skin through the drop of allergen. A new lancet was used for each allergen per patient. Excess allergens were wiped away with a sterile gauze. After 15 minutes, the largest diameter of each wheal produced was measured. Reactions with wheals larger than the negative control were considered positive.

MAST CLA

The Taiwan panel of allergens was used. The allergens included in the panel are house dust, *D. pteronyssinus*, *D. farinae*, cockroach mix, feather mix, dog, cat, *Candida spp*, *Aspergillus spp*, *Cladosporium spp*, *Penicillium spp*, *Alternaria spp*, Ragweed mix 1, grass mix, Pine mix, Willow mix, Eucalyptus, Mulberry, Bermuda grass, Pigweed mix, corn, wheat, vegetable mix, crab, shellfish mix, codfish, pork, beef, egg white, egg yolk, milk, shrimp, Brewer's yeast, soybean and peanut.

The MAST CLA was performed according to the manufacturer's instructions. Basically, test sera were incubated in MASTpettes which are coated with allergens. After incubation, the MASTpettes were washed and incubated with an enzyme-labelled anti-IgE antibody solution After washing, the MASTpettes were filled with photoreagents and further incubated. The photoreagents produce chemiluminescence when exposed to the enzyme-labelled anti-IgE; the chemiluminescence is then measured in a densitometer. The amount of chemiluminescence is proportional to the amount of allergen-specific IgE in the test serum. Results were graded 0-4 according to the manufacturer's instructions; grades of 0 and 1/0 are considered negative.

Statistical analysis

SPSS PC+ software is used in the analyses. Data were analysed by Chi-square and linear regression at a 95% significance level.

RESULTS

The MAST CLA presented positive rates of greater than 80% for *D. pteronyssinus*, *D. farinae*, and shrimp (Table 1). More than 70% of the allergens tested had positive rates of less than 50%.

Table 1. Positive rates of MAST CLA system

Allergen	No. patients tested	% positive
D. pteronyssinus	43	98
D. farinae	43	93
Shrimp	31	87
Shellfish mix	38	63
Codfish	37	54
Cat	42	52
Crab	38	50
Beef	36	50
House dust	43	49
Cockroach mix	43	49
Pork	37	41
Egg yolk	32	41
Vegetable mix	38	39
Cottonwood/Willow mix	40	38
Pigweed mix	40	38
Egg white	35	37
Pine mix	40	35
Ragweed mix	40	33
Bermuda grass	40	33
Dog	43	30
Grass mix	40	30
Peanut	30	30
Feather mix	43	28
Corn	39	28
Eucalyptus	40	25
Mulberry	40	25
Candida spp	42	24
Alternaria spp	40	23
Soybean	31	23
Milk	32	19
Penicillium spp	41	17
Brewer's yeast	31	13
Wheat	39	10
Cladosporium spp	42	7
Aspergillus spp	42	5

Table 2. Sensitivity, specificity and efficiency of MAST CLA against SPT

Allergen	No. tests	Sensitivity (%)	Specificity (%)	Efficiency (%)
D. pteronyssinus	43	100	17	88
D. farinae	43	100	38	88
Cat	43	25	46	44

Table 3. Correlation of SPT wheal size and MAST CLA grade

Allergen	Correlation coefficient	Probability
D. pteronyssinus	0.246	0.056
D. farinae	0.359	0.009
Cat	-0.059	0.353

Using the SPT as a standard, MAST CLA was found to have high sensitivity for the house dust mites but not for cat (Table 1). However, the test was more specific for cat than the house dust mites. The efficiency of MAST CLA for cat was only half that for the mites. There was significant association between results of SPT and MAST CLA for *D. pteronyssinus* ($p = 0.01$) and *D. farinae* ($p < 0.01$) but not for cat ($p = 0.27$). Linear regression of SPT wheal size and MAST CLA grade was performed. There was a significant correlation for *D. farinae* ($p = 0.01$) but not for *D. pteronyssinus* ($p = 0.06$) and cats ($p = 0.35$) (Table 3).

DISCUSSION

The MAST CLA system again confirms that the two house dust mites are the most important sources of inhalants involved in respiratory allergies; other prevalence studies in Malaysia have similar results.[1, 5-7] In Japan, it was reported that MAST CLA produced much lower positive rates of 31 and 30% for *D. farinae* and *D. pteronyssinus* respectively.[8] Allergy to house dust as deduced from MAST CLA results is lower than that reported in another SPT study in Malaysia but higher than that reported in Japan.[1,8] In comparison with SPT, MAST CLA demonstrated higher positive rates for pollen allergens and similar rates for mold allergens.[1] These differences can be attributed to many factors including inherent differences between *in vivo* and *in vitro* diagnostic assays, different potencies of allergens used, and differences in the study populations.

There is wide variation in the reported sensitivity and specificity of MAST CLA for inhalant allergens.[9,10] Results in this study indicate that MAST CLA is a very sensitive test for house dust mite allergies but not for cat allergy. The test has overall poor specificity. One factor contributing to the high percent of false positive with the MAST CLA is the interpretation of a "negative" result based on the MAST CLA grading system. The MAST CLA grading system is based on the qualitative levels of IgE detected. Due to unavailability of local studies on normal levels of specific IgE, it was arbitrarily decided that the grades 0 and 0/1 be considered negative. The presence of individuals with high levels of specific IgE but with negative SPT results is occasionally encountered by almost all assays measuring specific IgE; that too contributes to low specificities.

In the following discussion, the term 'efficiency' is used as the percent of correct results (*ie.* true positives and negatives) as compared with the standard test. The efficiency between MAST CLA and SPT had been reported as 91% for *D. pteronyssinus*, and 88% for

D. farinae.[11] An efficiency of 74.5% had been reported for cat dander.[12] That is higher than the efficiency found in this study; that may be due to differences between allergens from cat dander and cat fur (used in SPT). Those differences may also contribute to the insignificant association between results of the two tests and insignificant correlation between SPT wheal size and MAST CLA grades for cat allergies.

The material cost of the MAST CLA per patient is generally more than other commercial single allergen *in vitro* assays. The actual cost per allergen tested, however, is very much lower in comparison with other assays. One limitation of the MAST CLA when used with children is the difficulty of obtaining sufficient sera (at least 2 ml) in order for the complete panel of allergens in each MASTpette to be exposed.

In conclusion, the MAST CLA like other *in vitro* assays, only quantifies specific IgE. Which level of specific IgE should be considered a positive result need to be studied in further detail. MAST CLA results alone should not be used as a definitive diagnosis of allergies but should be used in conjunction with patient case history, and clinical examination.

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