

SKIN REACTIVITY TO HOUSEHOLD AEROALLERGENS IN CHILDREN WITH BRONCHIAL ASTHMA

By Y. H. Thong, Asma Omar, Anthony Kok and M. J. Robinson

SYNOPSIS

Thirty-three children of mixed ethnic and socio-economic backgrounds with bronchial asthma were skin-tested with five common household aeroallergens. All of these children demonstrated significant wheal and flare response to at least one of the aeroallergens tested, and 93% had significant reactivity to 2 or more. There was positive correlation of 69% between skin reactivity and history of allergenic contact. Environmental control would constitute an important step in the total management of children with this disease.

INTRODUCTION

Although the avoidance of allergen is the mainstay of therapy in allergic disorders, no previous attempt has been made to identify causative allergens in this community. In the present study, the extent of allergenic sensitisation to common household aeroallergens was evaluated in a group of children with bronchial asthma by skin-testing.

PATIENTS AND METHODS

The study population consisted of 33 children of mixed ethnic and socio-economic backgrounds with bronchial asthma attending the Paediatric Allergy Clinic of the University Hospital, Kuala Lumpur (Table I). These children were referred by medical officers and paediatricians in the Department. All patients had a history of intermittent wheezing for 1 to 8 years. Nineteen were males and 14 were females. Their ages ranged between 2½ to 12 years, with a mean of 7 years. Four were Malay, 12 Chinese and 17 Indian. A family history of allergy was present in 67% of these children. 73% had collateral allergic symptoms of rhinitis, conjunctivitis, atopic eczema, urticaria or angioedema. 33% had alleged allergies to food.

The aeroallergens for skin-testing were obtained from Center Laboratories, New York. The following concentrations of antigen, in protein nitrogen units (PNU), were used: housedust 20,000 PNU/ml,

TABLE I
SUMMARY DATA OF 33 CHILDREN
WITH BRONCHIAL ASTHMA

Age: Mean 7 years, range 2-12 years
Sex: Males 19, females 14
Race: Malay 4, Chinese 12, Indian 17
Family history of allergy: 67%
Associated allergic symptoms: 73%
Physical provocation factors: 73%

cat epithelium 10,000 PNU/ml, dog epithelium 10,000 PNU/ml, cockroach extract 20,000 PNU/ml, and mixed mould extract (alternaria, homodendrum, aspergillus, penicillium) 10,000 PNU/ml. The multiple prick technique for skin-testing was performed as follows: the volar aspect of the forearm was exposed and a drop of antigen or phenol-saline as control applied to the skin. Five pricks were made through the droplet with a 25-gauge needle, with gentle pressure so that no bleeding occurred. A separate needle was used for each test. The wheal and flare response at 20-30 minutes was graded from 0 to 4. A wheal response of 2 or more (>1mm) was considered significant.

RESULTS

The skin reactivity of 33 asthmatic children to 5 common household aeroallergens is presented in Table II. All asthmatic children demonstrated a positive response to at least one aeroallergen, 93% had significant reactivity to 2 or more, 73% to 3 or more, 45% to 4 or more, and 15% to all 5 aeroallergens. Housedust produced the largest number of responders, and mixed moulds the least. There was positive correlation of 69% between skin reactivity and history of exposure or provocation with housedust, cat and dog epithelium, and cockroach extract.

Department of Paediatrics, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia.

Presented in part at the 10th Malaysia-Singapore Congress of Medicine, Singapore, 1975.

Y.H. THONG, M.B., B.S., F.A.A.P., Lecturer in Paediatrics.

ASMA OMAR, M.B., B.S., Trainee Medical Officer.

ANTHONY KOK, M.B., M.D., M.R.C.P., Lecturer in Paediatrics.

M.J. ROBINSON, M.B., M.D., F.R.A.C.P., Professor of Paediatrics

TABLE II
SKIN REACTIVITY OF 33 ASTHMATIC
CHILDREN TO HOUSEHOLD
AEROALLERGENS

Aeroallergens	Positive Responders	
	Number ¹ (33)	%
Housedust	27	82
Cat epithelium	20	61
Dog epithelium	25	76
Cockroach extract	26	79
Mixed moulds	13	39

DISCUSSION

The discovery of the IgE class of immunoglobulins and its designation as the reaginic antibody (Ishizaka, 1967; Johansson, 1967; Johansson *et al*, 1968) some ten years ago provided a major break through in the understanding of allergic phenomena. In skin-testing, allergen introduced into the skin reacts with skin-fixed IgE to produce a wheal and flare response. In Bronchial asthma, close correlation exists between skin-testing, clinical history, serum IgE and bronchial provocation tests (McAllan *et al*, 1970; Stenius *et al*, 1971; Norman *et al*, 1973; Bruce *et al*, 1974). The scratch test is least sensitive, the intradermal test most sensitive, and the single prick test intermediate (Idrajana *et al*, 1971). The multiple prick technique, employed in the present studies, is much easier to perform in children but almost as sensitive as the intradermal test, without its disadvantages of false positives and adverse reactions (Santilli *et al*, 1974).

Bronchial asthma is a disease characterized by hyperreactivity of the bronchi on exposure to immunogenic or irritant stimuli, resulting in paroxysms of bronchial constriction. Hyperreactivity of bronchi in asthma is best explained on the basis of an impairment of B-adrenergic receptor activity (Nelson, 1975). Under these circumstances, bronchial constriction occurs under the influence of IgE-mediated release of histamine and other vasoactive amines, or increased vagal activity arising from epithelial irritant receptors within the airways (Gold,

1973). In childhood bronchial asthma, the allergic component is the major factor leading to bronchoconstriction. The results of the present studies indicate that household aeroallergens play an important role in asthma. Since children spend most of their time indoors, environmental control in the home and school is an important first step in the total management of the asthmatic child. There is a need for further studies to define the role of other allergens in this community, not only with regard to bronchial asthma but to other allergic diseases as well.

ACKNOWLEDGEMENTS

We would like to thank Mrs. Ng Mo Tsing and the staff of Polyclinic E, University Hospital, Kuala Lumpur, for assistance.

REFERENCES

1. Bruce, C.A., Rosenthal, R.R., Lichtenstein, L.M. and Norman, P.S.: Diagnostic tests in ragweed allergic asthma. A comparison of direct skin tests, leukocyte histamine release and bronchial challenge. *J. Allerg. Clin. Immunol.*, 53: 230-239, 1974.
2. Gold, W.M.: Cholinergic Pharmacology in Asthma. In 'Asthma', edited by Austin, K.F., and Lichtenstein, L.M. New York, Academic Press, pp. 169-184, 1973.
3. Idrajana, T., Spijksma, F.T.H.M., Voorhorst, R.: Comparative study of the intradermal, scratch and prick tests in allergy. *Ann. Allerg.*, 29: 639-650, 1971.
4. Ishizaka, K., Ishizaka, T.: Identification of gamma E-antibodies as a carrier of reaginic activity. *J. Immunol.*, 99: 1187-1198, 1967.
5. Johansson, S.G.O.: Raised levels of a new immunoglobulin class (IgND) in asthma. *Lancet*, 2: 951-953, 1967.
6. Johansson, S.G.O., Bennich, H., Wide, L.: A new class of immunoglobulin in human serum. *Immunology*, 14: 265-272, 1968.
7. McAllan, M.K., Assem, A.S.K., Maunsell, K.: Housedust mite asthma, results of challenge tests on five criteria with *Dermatophagoides pteronyssinus*. *Brit. Med. J.*, 2: 501-504, 1970.
8. Nelson, H.S.: The Beta-adrenergic Theory of Bronchial Asthma. *Pediat. Clin. N. Amer.*, 22: 53-61, 1975.
9. Norman, P.S., Lichtenstein, L.M., Ishizaka, K.: Diagnostic tests in ragweed hay fever. A comparison of direct skin tests, IgE antibody measurements and basophil histamine release. *J. Allerg. Clin. Immunol.*, 52: 210-224, 1973.
10. Santilli, J., Goodfriend, L., Marsh, D.G.: Puncture skin-testing with purified protein pollen antigens. A useful tool for genetic studies in man. Proceedings of the Annual Meeting, American Academy of Pediatrics, 1974.