

The prevalence of immediate positive skin tests to *Dermatophagoides pteronyssinus* and grass pollen in schoolchildren

R. C. GODFREY and M. GRIFFITHS

Faculty of Medicine and Community Medicine, Southampton General Hospital

Summary

The prevalence of immediate positive reactions to prick testing with house dust mite (*Dermatophagoides pteronyssinus*) and grass pollen allergens was determined in a random sample of 303 children aged between 8 and 14 years from two Southampton schools. One hundred and two (33.7%) showed positive reactions, fifty to both *D. pteronyssinus* and grass pollen, thirty to *D. pteronyssinus* only and twenty-two to pollen only. Allergic symptoms were present in fifty-one of the 102 children with positive skin tests; amongst thirty children with *D. pteronyssinus* skin sensitivity by itself, only six had symptoms suggestive of allergic disorder. Significantly more children with positive than with negative tests were reported by their parents to have suffered from recurrent bronchitis during early childhood.

Introduction

Immediate hypersensitivity is conveniently demonstrated by skin prick testing with allergenic extracts, an immediate weal and flare response indicating the presence of specific reaginic IgE antibody in the serum (Stenius *et al.*, 1971). A tendency to make excess IgE antibody against common allergens is characteristic of atopic subjects, and it underlies disorders such as seasonal rhinitis and allergic asthma. Prompted by evidence that allergic asthma may be becoming more common (Morrison Smith, Harding & Cumming, 1971), we decided to determine the prevalence of allergic symptoms in a randomly selected group of children, at the same time using skin tests to establish how well symptoms correlated with immediate skin hypersensitivity to two common allergens. A surprising finding was the large number of children with unequivocally positive skin tests but no evidence of allergic disorder.

Materials and methods

The children attended two Southampton schools. Those aged 8-11 were from Bitterne Park Middle School (School A) and those aged 12-14 were from Bitterne Park Secondary School (School B). The sample was randomized by taking all children born on even

Correspondence: Dr R. C. Godfrey, Faculty of Medicine, Southampton General Hospital, Southampton SO9 4XY.

dates from 1961 to 1967. Parents were contacted by letter and asked to give written consent for their children to be skin tested. Parents who failed to return the consent forms for children at school A were contacted a second time in an attempt to improve the percentage of children tested. In addition, parents of children at school A were sent a questionnaire in which they were asked to state whether their child suffered from asthma, hayfever or eczema or whether there had been recurrent attacks of bronchitis, with or without wheezing, during childhood. The questionnaires were returned by post.

Skin tests were performed by the prick method on the volar aspect of the forearm. The tests were made with *Dermatophagoides pteronyssinus* and mixed grass pollen extracts (Bencard Limited) together with positive and negative controls (histamine 0.05% and carbol saline). Whilst waiting for development of reactions, the children were asked about absence from school with cough or other chest complaints. Asthma, hayfever and eczema were specifically mentioned by the interviewer, who described typical symptoms when necessary. The questioning took place before either child or interviewer knew the result of the skin tests. The tests were read after 10 min and the diameter of the weals recorded in mm.

Results

Altogether 60.2% of the random sample were skin tested. At school A the percentage achieved was 72%, but it was only 50% in school B. Nothing suggested that children who were not skin tested because of parental refusal differed from those tested, particularly with regard to the presence or absence of allergic disorders.

Table 1. Prevalence of positive skin tests in the total sample of 303 children

Allergen	Number of children with positive skin tests	Percentage of total children (303)
<i>D. pteronyssinus</i>	30	9.9%
Mixed grass pollens	22	7.3%
Both <i>D. pteronyssinus</i> and mixed grass pollens	50	16.5%
Total	102	33.7%

Table 1 shows the prevalence of positive skin tests, taking weals of 3 mm or more with surrounding flare to be positive reactions. In the few cases where both control (carbol saline) and allergens produced similar responses, skin tests were recorded as negative. All children in the sample responded to the positive control (histamine) with a weal of 3 mm or more. Of the 303 children tested 102 showed positive results, nearly equally divided between males and females (55 of 161 males, and 47 of 142 females). Amongst those with positive reactions more children responded to both *D. pteronyssinus* and mixed grass pollens than to either allergen alone.

Table 2 shows reported symptoms in relation to skin test results. About 50% of children with grass pollen sensitivity on skin testing gave a history of allergic disorder (mainly hayfever), whereas only 20% of those with *D. pteronyssinus* sensitivity alone described symptoms. Altogether fifty-one of the 102 children with positive skin tests were asymptomatic. The mean size of the skin test weals in asymptomatic

children was 5·4 mm compared with 7·8 mm in symptomatic children, a statistically significant difference ($P < 0\cdot001$, Student's *t*-test). Of the 201 children with negative skin tests, six gave a 'false positive' history of hayfever and one of asthma, although ten described eczema. Eczema proved difficult to identify, and the figures may include a number of children with skin lesions other than the flexural eczema characteristically associated with allergic disorders.

No significant relationship was found between the prevalence of positive skin tests and age within this group of children, nor did the month of the year in which children were born have any bearing on skin test results. It was not possible to study the relationship between skin test results and social class, because the great majority of children came from similar social backgrounds (Social Classes III and IV).

One hundred and sixty-seven parents of children in school A replied to the postal questionnaires (95% of the total sent). Parents confirmed children's reported symptoms in twenty-two out of thirty cases amongst those with positive skin tests. In those with negative skin tests, parents confirmed their children's complaints of asthma or hay-

Table 2. Relationship between the result of skin tests and children's symptoms

	Positive to <i>D. pteronyssinus</i>	Positive to mixed grass pollen	Positive to both mixed grass pollen and <i>D. pteronyssinus</i>	Total
Hayfever only	4	10	21	35
Asthma only	—	—	3	3
Eczema only	1	1	3	5
Combination of symptoms	1	1	6	8
Total with some symptom	6	12	33	51
Total asymptomatic	24	10	17	51

fever in three of seven cases. Parents of the fifty-seven children with positive skin tests reported twenty-three cases of recurrent bronchitis at some period during childhood (40·4%), whereas only twenty reports of bronchitis were made amongst the 111 children with negative skin tests (18·0%). This difference is statistically significant ($0\cdot001 < P < 0\cdot005$, Chi-square test). None of the children reported to have suffered recurrent bronchitis in early life complained of asthma at the time of this study; thirteen, all with positive skin tests, complained of hayfever.

Discussion

Whilst the number of children with allergic symptoms was in line with other British studies (Morrison Smith *et al.*, 1971; Morrison Smith, 1961; Dawson *et al.*, 1969), an unexpected finding was that a large number of asymptomatic children had unequivocally positive skin tests, particularly to *D. pteronyssinus* allergen. Of the 252 asymptomatic children, fifty-one (20·2%) had positive skin tests. This may be compared with the study by Williams & McNicol (1969) of asthma and bronchitis in Melbourne, where 7·5% of ninety-four control asymptomatic children had positive skin tests,

although in a later report (McNicol & Williams, 1973) the number of controls with positive tests at some stage had risen to 15%.

Although the great majority of children with asthma or hayfever in the present study had positive skin tests, the large number of asymptomatic children also with positive tests emphasizes the importance of non-reaginic mechanisms in producing symptoms (Stevenson *et al.*, 1975). Positive skin tests to grass pollen allergen seemed more likely to be associated with symptoms than positive skin tests to *D. pteronyssinus*, but one third of even those children positive to both allergens were asymptomatic. This reinforces the need for careful history taking, preferably supported by provocation tests, in weighing the importance of allergens discovered by skin tests.

The simplicity and safety of prick testing prompts further investigation of apparently normal populations to determine the mode of inheritance of skin test positivity, its time of acquisition, and its behaviour with advancing age. In particular, the association between recurrent bronchitis and positive skin tests needs confirmation, since it may support the hypothesis that atopy develops when reduced immune protection of mucosal surfaces allows penetration of allergens (Soothill, 1974). Alternatively, it may reflect no more than a genetically determined association between atopy and other host factors such as bronchial hyperreactivity and an increased susceptibility to respiratory virus infection (Horn & Gregg, 1973).

Acknowledgments

We are very grateful to the Headmasters of Bitterne Park Middle School and Bitterne Park Secondary School, Mr J. H. Guilmant and Mr B. A. Hurford-Jones, whose co-operation made this study possible. We thank also Dr W. E. Waters for epidemiological advice, and Mrs C. F. Gradidge for her help with skin testing.

References

- DAWSON, B., HOROBIN, G., ILLSLEY, R. & MITCHELL, R. (1969) A survey of childhood asthma in Aberdeen. *Lancet*, **i**, 827.
- HORN, M.E.C. & GREGG, I. (1973) Role of viral infection and host factors in acute episodes of asthma and chronic bronchitis. *Chest*, **63**, supplement, 445.
- McNICOL, K.N. & WILLIAMS, H.E. (1973) Spectrum of asthma in children—II, allergic components. *British Medical Journal*, **4**, 12.
- MORRISON SMITH, J. (1961) Prevalence and natural history of asthma in schoolchildren. *British Medical Journal*, **1**, 711.
- MORRISON SMITH, J., HARDING, L.K. & CUMMING, G. (1971) The changing prevalence of asthma in schoolchildren. *Clinical Allergy*, **1**, 57.
- SOOTHILL, J.F. (1974) Immunodeficiency and allergy. *Clinical Allergy*, **3**, supplement, 511.
- STENIUS, B., WIDE, L., SEYMOR, W.M., HOLFORD-STREVS, V. & PEPYS, J. (1971) Clinical significance of specific IgE to common allergens. *Clinical Allergy*, **1**, 37.
- STEVENSON, D.D., MATHISON, D.A., TAM, E.M. & VAUGHAN, J.H. (1975) Provoking factors in bronchial asthma. *Archives of Internal Medicine*, **135**, 777.
- WILLIAMS, H.E. & McNICOL, K.N. (1969) Prevalence, natural history, and relationship of wheezy bronchitis and asthma in children. An epidemiological study. *British Medical Journal*, **4**, 321.

This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.