

Original article

Experience with quantitative IgE antibody analysis in relation to allergic disease within the BAMSE birth cohort – towards an improved diagnostic process

This paper argues that with a certain allergen profile of airborne and food allergens and the use of total IgE-antibody levels, combined with the number of allergens positive at test represent a powerful tool to identify allergic disease in childhood. The allergens featured in such a profile will be dependent on the subject's age and geographical location.

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Background

Allergic diseases constitute a major cause of morbidity in industrialized countries. Thus, secondary preventive measures, such as early diagnosis, early treatment and patient education, have long been a focus of research. They are considered the cornerstones of management strategies (1). Early sensitization to certain foods followed by sensitization to airborne allergen seem to predict the development of respiratory disease in later childhood (2,3). Such predictive sensitization has also been observed in children who manifest early signs of allergic disease and ultimately develop airway hyperresponsiveness by the time they are in their eighth year (4). As there is a consensus that early intervention in terms of diagnosis, treatment and patient education may reduce the risk for precipitating allergic disease in children, it seems important to assess available diagnostic tools and their optimal use in the diagnosis of allergic disease (5). The aim of this presentation is to elucidate whether quantification of immunoglobulin E (IgE), either through a food mixture or an inhalant allergen panel (Phadiatop® and fx5®), the sum of specific IgE antibody titres for single allergens or the sum of allergens which tested positive analysed separately or in combination would be appropriate for the identification of allergic disease in the same birth cohort of 4-year-old children (6).

Material and methods

This study is based on 75% ($n = 4089$) of all eligible children from northern Stockholm, born between 1994 and 1996 in predefined geographic areas. Study design, enrolment, criteria for inclusion, procedures of data collection, and definitions of exposure and outcome have all been described in previous papers (7–9). Data on exposure and outcome were obtained by parental questionnaires when the child was 3 months and again when 4 years old. Among the 92% who responded to the questionnaire at 4 years of age, sera were obtained from 2612 (88%) children for analysis of IgE antibodies, performed with a Pharmacia CAP system™ (Phadiatop® and food mix fx5®). The cut-off level of positivity for serology was ≥ 0.35 kU_A/l. Blood samples were further analysed for IgE antibodies to the eight aeroallergens and six food allergens most commonly implicated in allergic disease and included in the Phadiatop® and fx5® test panels.

Results

A positive Phadiatop® or fx5® result was found in 24% of children in their fourth year. A rather poor correlation was found between the two tests ($r = 0.39$). Occurrence of IgE antibody ≥ 3.5 kU_A/l for Phadiatop® and fx5® in combination could predict any suspected allergic disease (asthma, rhinitis, atopic eczema dermatitis syndrome and allergic reaction to food) in 97.4% of these patients. However, the presence of ≥ 3.5 kU_A/l antibody, detected

by either Phadiatop® or fx5® on their own, was far less efficient to predict allergic disease. The two mixes of airborne and food allergens were also associated not only with severity of allergic disease in terms of target organs involved, but also with the severity of recurrent wheeze, in particular in boys with a positive Phadiatop® who exhibited significantly limited peak flows compared to those with a negative test. As for individual allergens, test positivity for sensitization to inhalant allergens indicated birch, cat and timothy as the most prevalent and sensitization to birch, peanut, cat and horse revealed the highest levels of IgE antibody to the allergens tested among 4-year-olds. The qualitative association between sensitization (expressed as sensitized, yes/no) to any of the 14 allergens and any allergic disease, i.e. asthma, suspected allergic rhinitis, atopic eczema dermatitis syndrome, and oral gastro-intestinal symptoms (OGIS), was rather poor. However, the total IgE antibody levels of

allergens testing positive above 17.5 kU_A/l connoted a 75% likelihood of identifying a child with any allergic disease. The presence of IgE antibody levels to four allergens testing positive revealed the same likelihood for identification of disease and antibody to seven positive allergens, a likelihood of almost 90%.

Conclusion

We suggest that with a certain allergen profile of airborne and food allergens and the use of total IgE antibody levels, combined with the number of allergens positive at test, represent a powerful tool to identify allergic disease in childhood. The allergens featured in such a profile will be dependent on the subject's age and geographic location.

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