

Short communication

Cockroach sensitivity in asthmatic Egyptian children

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Cockroach-specific IgE antibodies (CR-IgE) were assayed in the sera of 51 asthmatic and 33 healthy, nonallergic children. Cockroach IgE was detected in 43 asthmatic children (84%), seven of whom showed a high CR-IgE response (≥ 1.5 IU/ml). Only three of the healthy children (9%) had a positive response, and none of them were in the strongly positive category. The difference from the asthmatic group was statistically significant ($P < 0.001$). Children with clinically mild asthma had a significantly lower CR-IgE positivity rate than moderate and severe cases. The presence of other allergic manifestations or family history of atopy had no relationship to CR-IgE, nor did the residency, age, duration of illness, or total serum IgE levels. However, the CR-IgE titres were positively correlated with the absolute eosinophil counts. Thus, cockroach antigens are common inhalant allergens in Egyptian asthmatic children.

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The implication of cockroach antigens in the causation of allergy has become a subject of concern in many parts of the world. Antigens of this insect are among the house-dust allergens inhaled by atopic individuals (1). Sensitization to the cockroach primarily develops by inhalation of its emanations or disintegrating parts (2) and secondly by contact (3). The exoskeleton, faeces, and secretions are a component of house dust especially in poorer homes (4). Multiple factors, including status of the immune system, dosage of inhalant exposure, and length of exposure all appear to play a role in the rate of sensitization (5).

In Egypt, there are four common species of cockroach, namely, *Periplaneta americana* (American cockroach), *Blatta germanica* (German cockroach), *Blatta orientalis* (Oriental cockroach), and *Rhyllodromia superlectitium* (6). As inhabitants of the developing world and because of overcrowding, Egyptian children are expected to be at risk of cockroach allergy, and this was the stimulus for the study.

Material and methods

The study comprised 51 asthmatic children (11 girls and 40 boys aged 5.6–12 years, mean age 8 ± 2.4) attending the Pediatric Allergy and Immunology

Unit of Ain Shams University Children's Hospital in Cairo. The patients were enrolled when presenting to the hospital in asthmatic attack and before they received any therapy. They were classified according to clinical severity (7) into 17 children with mild asthma, 19 children with moderate asthma, and 15 children with a severe form of asthma. Children with severe asthma were under long-term therapy with various regimens, some of which included corticosteroids. None of the patients were receiving immunotherapy. The controls comprised 33 healthy children who were selected from children presenting with minor surgical and traumatic problems to the casualty department of the hospital. None of them had present or previous history of allergic disease or a family history of atopy (nine girls and 23 boys aged 5–12 years, mean 7.3 ± 2.6 years).

The patients were evaluated for the duration of illness, family history of allergy, presence of other allergic manifestations, and residency (urban, suburban, or rural). The patients were subjected to physical examination and chest radiograph. Absolute eosinophil counts (AEC) were obtained by multiplying the total white blood cell count by the percentage of eosinophils in the peripheral blood smear. Serum IgE levels were assayed by ELISA (Enzygnost, Behringwerke, Marburg, Germany).

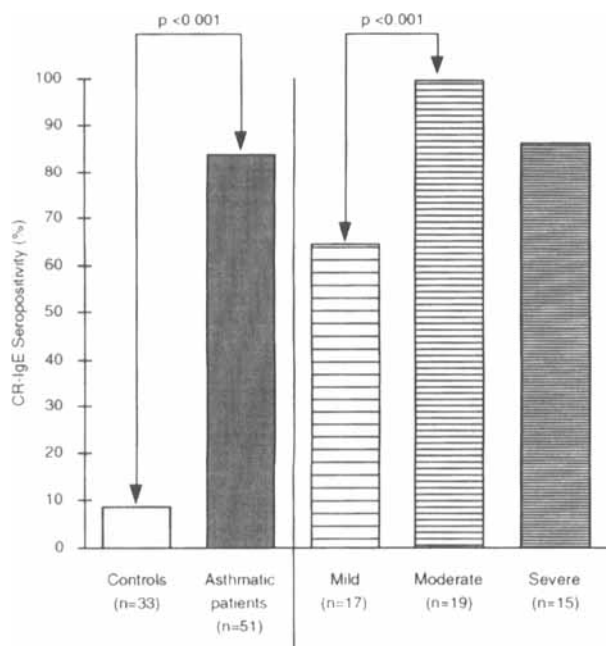


Fig. 1. Presence of IgE antibodies in healthy ($n = 33$) and asthmatic ($n = 51$) children with mild, moderate, and severe asthma.

The IgE levels were expressed as the percentage of the actual value of the subject in relation to the higher normal for age (8). Estimation of IgE antibodies against cockroach antigens (CR-IgE) was performed with the ALA STAT EIA (Diagnostic Products Corporation DPC, Los Angeles, CA 90045, USA). This kit measures antibodies to a common cockroach antigen. The CR-IgE concentrations were ranked into five classes (0–IV) according to the manufacturer's instructions.

The results were statistically analysed with the chi-square test (χ^2) and the Wilcoxon rank (w) and correlation coefficient (r) tests via a standard computer program (Statview).

Results and Discussion

The mean total IgE (percentage of normal) was higher in the asthmatic children (range 4–2200%, GM 320%) than in the controls (range 4–3000%, GM 69%). The difference was statistically significant ($w = 4.5$, $P < 0.001$).

The number of children with CR-IgE titres ≥ 0.35 IU/ml was significantly higher in patients than in controls, i.e., 84% (43/51) in the former and 9% (3/33) in the latter ($\chi^2 = 45.76$, $P < 0.001$) (Fig. 1). Out of the 43 CR-IgE-positive asthmatic children, seven had titres ≥ 1.5 IU/ml (i.e., class II), as compared to none of the three healthy children with CR-IgE. Children with clinically mild asthma had a lower seropositivity rate (65%) than children with moder-

ate or severe asthma (100% and 87%, respectively, $\chi^2 = 8.05$, $P < 0.001$ for mild or moderate asthma).

The prevalence of cockroach sensitivity was similar in patients living in urban, suburban, and rural areas ($\chi^2 = 2.9$, $P > 0.05$). The family history of atopy did not influence the CR-IgE positivity rates ($\chi^2 = 0.002$, $P > 0.05$), and neither did the presence of allergic diseases other than asthma ($\chi^2 = 0.03$, $P > 0.05$). The CR-IgE titres did not correlate with age, duration of illness or total serum IgE levels. However, there was a weak positive correlation between the CR-IgE values and absolute eosinophil counts ($r = 0.34$, $P < 0.05$).

The presence of a positive CR-IgE response in 43 out of the 51 (84% asthmatic children enrolled in this study, as compared to 9% of the healthy children, and the higher antibody levels in the former indicate that cockroaches are a source of important respiratory allergens in Egypt. A previous study in Egypt revealed positive skin prick tests to cockroach in 33% of 200 Egyptian children (9). Although skin tests are more sensitive and less specific than blood tests for antibodies (10, 11), the prevalence was even higher in our children. The difference is possibly due to the fact that our children were from the lower socioeconomic classes, an origin which is a risk factor for cockroach allergy. Moreover, cockroach-specific IgE antibody has been considered a major risk factor for acute asthmatic attacks and emergency room admissions (13, 14), and all of our patients were enrolled while presenting with asthmatic attacks of varying severity. The high prevalence of cockroach sensitivity among the patients with moderate and severe asthma agrees with the study by Kang and et al. (1992) (11), who stated that cockroach asthma is often severe.

The prevalence of cockroach sensitivity among asthmatics in countries with a climate like Egypt's varies from 50% in Argentina to 58% in Taiwan and even up to 69% in Atlanta, GA, USA (15–17). Several studies from the USA have demonstrated that cockroach asthma is common in inner-city urban communities (11, 12, 18), indicating that population density and socioeconomic status, not residential classification, are the main determinants of cockroach infestation of homes.

The CR-IgE titres correlated to some extent with the absolute eosinophil counts. This observation supports a previous report that cockroach allergens are associated with the late-phase inflammatory response (19).

Thus, cockroach antigens present an important indoor inhalant allergen in asthmatic Egyptian children, independently of residential classification. It seems that cockroach control and indoor allergen-avoidance measures are among the priorities in the battle against childhood asthma in Egypt.

References

1. GARCIA DP, CORBETT ML, SUBLETT JL, POLLAR SJ. Cockroach allergy in Kentucky: a comparison of inner city, suburban, and rural small town populations. *Ann Allergy* 1994; 72 (3): 203–8.
2. SCHULANER FA. Sensitivity to the cockroach in three groups of allergic children. *Pediatrics* 1970; 45: 465.
3. BERNTON HS, BROWN H. Insect allergy – the allergenicity of the excrement of the cockroach. *Ann Allergy* 1970; 28: 543–7.
4. KANG B. Study on cockroach antigen as a probable causative agent in bronchial asthma. *J Allergy Clin Immunol* 1976; 58: 357–65.
5. DUFF AL, PLATTS-MILLS TAE. Allergens and asthma. *Pediatr Clin North Am* 1992; 39 (6): 1277–91.
6. HUSSEIN MF, HAMDI AR, KASEM EA, BISHAI HA, ABDEL WAHAB A, eds. The cockroach. In: *Principles of animal biology*. 4th ed. Cairo: Dar El-Maareff 1978: 444–61.
7. SLY RM. Bronchial asthma. In: BEHRMAN RE, Kliegman BM, VAUGHAN VC, eds. *Nelson textbook of pediatrics*. 14th ed. Philadelphia: WB Saunders, 1992: 587–95.
8. KJELLMAN N, JOHANSSON SGO, ROTH A. Level of serum IgE of normal subjects at different ages. *Clin Allergy* 1976; 6: 51.
9. ABDEL ALIM SM. The role of some household insects as inhalant allergens in Egyptian asthmatic children: efficacy of immunotherapy in cockroach asthma [Thesis]. Cairo: University of Cairo, 1992: 275 pp.
10. SHAPIRO GG. Diagnostic methods for assessing the patient with possible allergic disease. In: BIERMAN CW, PEARLMAN DS, eds. *Allergic disease from infancy to adulthood*. 2nd ed. Philadelphia: WB Saunders, 1988: 224–38.
11. KANG BC, WU CW, JOHNSON J. Characteristics and diagnosis of cockroach-sensitive bronchial asthma. *Ann Allergy* 1992; 68 (3): 237–44.
12. CALL RS, SMITH TF, MORRIS E, CHAPMAN MD, PLATTS-MILLS TAE. Risk factors for asthma in inner city children. *J Pediatr* 1992; 121 (6): 862–6.
13. CHAPMAN MD, POLLART SM, LUCZYNSKA CM, PLATTS-MILLS TAE. Hidden allergic factors in the etiology of asthma. *Chest* 1988; 94 (1): 185–90.
14. POLLART SM, CHAPMAN MD, FIOCCO GP, ROSE G, PLATTS-MILLS TAE. Epidemiology of acute asthma: IgE antibodies to common inhalant allergens as a risk factor for emergency room visits. *J Allergy Clin Immunol* 1989; 83 (2): 875–82.
15. LAN JL, LEE DT, WU CH, CHANG CP, YEH CL. Cockroach hypersensitivity: preliminary study of allergic cockroach asthma in Taiwan. *J Allergy Clin Immunol* 1988; 82 (5, Pt 1): 736–40.
16. ALONSO A, ALBONICO JF, SCAVINI LM, RODRIGUEZ SM, PIONETTI CH, MOUCHIAN K. Immunochemical properties of the antigens of *Blattaria sudamericana*. *Allergol Immunopathol (Madr)* 1987; 15 (2): 109–15.
17. DE BLAY F, KASSEL O, CHAPMAN M, OTT M, VEROT A, PAULI G. Demonstration of major cockroach allergens in house dust by the ELISA test [Letter]. *Press Med* 1992; 21 (35): 1685.
18. KANG BC, JOHNSON J, VERES-THORNER C. Atopic profile of inner city asthma with a comparative analysis on the cockroach-sensitive and ragweed-sensitive subgroups. *J Allergy Clin Immunol* 1993; 92 (6): 802–11.
19. POLA J, VALDIVIESO R, ZAPATA C, QUIRCE S, HINOJOSA M, LOSADA E. Specific bronchial challenge in cockroach asthma. *Allergol Immunopathol (Madr)* 1988; 16 (3): 171–3.