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The Role of Cockroach Allergy and Exposure to Cockroach Allergen in Causing Morbidity among Inner-City Children with Asthma

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ABSTRACT

Background It has been hypothesized that asthma-related health problems are most severe among children in inner-city areas who are allergic to a specific allergen and also exposed to high levels of that allergen in bedroom dust.

Methods From November 1992 through October 1993, we recruited 476 children with asthma (age, four to nine years) from eight inner-city areas in the United States. Immediate hypersensitivity to cockroach, house-dust-mite, and cat allergens was measured by skin testing. We then measured major allergens of cockroach (Bla g 1), dust mites (Der p 1 and Der f 1), and cat dander (Fel d 1) in household dust using monoclonal-antibody-based enzyme-linked immunosorbent assays. High levels of exposure were defined according to proposed thresholds for causing disease. Data on morbidity due to asthma were collected at base line and over a one-year period.

Results Of the children, 36.8 percent were allergic to cockroach allergen, 34.9 percent to dust-mite allergen, and 22.7 percent to cat allergen. Among the children's bedrooms, 50.2 percent had high levels of cockroach allergen in dust, 9.7 percent had high levels of dust-mite allergen, and 12.6 percent had high levels of cat allergen. After we adjusted for sex, score on the Child Behavior Checklist, and family history of asthma, we found that children who were both allergic to cockroach allergen and exposed to high levels of this allergen had 0.37 hospitalization a year, as compared with 0.11 for the other children ($P = 0.001$), and 2.56 unscheduled medical visits for asthma per year, as compared with 1.43 ($P < 0.001$). They also had significantly more days of wheezing, missed school days, and nights with lost sleep, and their parents or other care givers were awakened during the night and changed their daytime plans because of the child's asthma significantly more frequently. Similar patterns were not found for the combination of allergy to dust mites or cat dander and high levels of the allergen.

Conclusions The combination of cockroach allergy and exposure to high levels of this allergen may help explain the frequency of asthma-related health problems in inner-city children.

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Morbidity due to asthma is disproportionately high among inner-city residents,¹ for reasons that are not completely understood. Proposed explanations include increased exposure to allergens,² poor air quality,³ psychosocial problems,⁴ and inadequate access to good medical care.⁴

Allergens involved in causing asthma include those derived from house-dust mites,⁵ animal dander,⁶ and mold spores.⁷ In particular, it has been suggested that exposure to cockroach allergen may be an important factor in asthma in inner-city areas,⁸ since cockroaches are ubiquitous and are highly allergenic.^{9,10} However, a clear causal relation among allergy to cockroaches, increased levels of cockroach allergen, and asthma has not been demonstrated.

As part of the National Cooperative Inner-City Asthma Study, we performed a comprehensive analysis of factors that might be associated with the severity of asthma in inner-city children. We tested the hypothesis that morbidity due to asthma is highest among children who are both allergic to a specific allergen and exposed to high levels of that allergen in bedroom dust.