

Season of birth and cockroach allergen sensitization in children with asthma

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A number of humoral and cellular factors affect susceptibility to the development of allergy, some of which are present only in early infancy.¹ This has led to the concept that allergen exposure in infancy may be critical to the development of sensitization to an allergen, which is supported by month-of-birth studies, relating aeroallergen (especially pollen and dust mite) exposure in infancy to the development of sensitization and asthma.¹⁻⁵

Recent research findings suggest a dose-response relationship between exposure and sensitization to cockroach allergen.⁶ Over 60% of inner-city residents with asthma are sensitized to cockroach allergen.⁶ A seasonal indoor variation of cockroach allergen level has not been reported; however, there is evidence to suggest that cockroach allergen level decreases with extermination and cleaning in an inner-city dormitory.⁷ To date, no study has examined the relationship between time of birth and cockroach allergen sensitivity.

This report addresses the hypothesis that there is an association between season of birth and risk of sensitization to cockroach allergen in children with asthma. We chose to examine cockroach allergen because it can be a common allergen found in homes of children with atopic asthma.

METHODS

The study is a retrospective chart review of 159 children with asthma, aged 5 to 18 years, who were seen in a metropolitan Chicago pediatric allergy outpatient clinic between March 1990 and September 1996. Most of the patients were self referrals or referrals from community urgent-care centers who did not have primary care physicians. Patients receiving immunotherapy were excluded. Demographic and medical history data, including area of residence, were collected. Suburban versus urban residence was determined by zip code. If the home was in one of 55 zip codes that lay within the Chicago city boundaries, residents were considered to be urban dwellers.

Immediate wheal and flare skin tests were performed by the prick-puncture method with bifurcated needle and glycerinated

full-strength mixed (German and American) cockroach allergen extract (Bayer, Spokane, Wash.). This extract is able to identify individuals who are sensitized to the common cockroach allergens found indoors in the United States. The wheal diameters observed at 15 minutes were compared with skin test reactions produced by a histamine (10 mg/ml) positive control and phenol-saline-human serum albumin negative control. Wheal diameters greater than or equal to the histamine control were considered positive. All the eligible patients denied use of oral and nasal medications containing antihistamine and had an acceptable histamine response (≥ 5 mm above the negative control).

Analysis of the frequency of sensitization to cockroach allergen and its association with season of birth and other factors was performed with chi-square tests and logistic regression. Season of birth was coded according to the calendar year (i.e., spring: March 20-June 20, summer: June 21-September 21; fall: September 22-December 20; and winter: December 21-March 19). Adjustment for possible important covariates or effect modifiers (age, gender, race, urban residence, and type of medical insurance as a surrogate measure of socioeconomic status) was made by using stepwise logistic regression. The analyses were performed with the SAS statistical package, release 6.07 (SAS Institute, Cary, N.C.).

RESULTS

There were 110 (69%) black children, 33 (21%) white children, and 16 (10%) children of other races; 101 (63%) were male. One hundred and twenty-six (79%) resided in the city, and 111 (70%) were on public assistance. Overall, 79 (50%) of the 159 children were sensitized to cockroach allergen. However, those who were not sensitized could have been sensitized to other allergens not examined. The number of children born in each season ranged from 32 to 50. The rate of sensitization to cockroach allergen in each season is shown in Fig. 1. Variation in the rate of sensitization across the four seasons was statistically significant ($X^2_3 = 8.25$, $p = 0.041$) with the rate in winter (72%) higher than that in the other three seasons (48%, 42%, and 43% for spring, summer, and fall, respectively). The association between season of birth and the risk of sensitization to cockroach allergen remained significant ($p = 0.040$) after controlling for age, gender, race, urban residence, and medical insurance by using stepwise logistic regression analysis. Black children and children receiving public assistance were more likely to be sensitized to cockroach allergen.

DISCUSSION

This is the first examination of sensitization to cockroach allergen as it relates to season of birth in children

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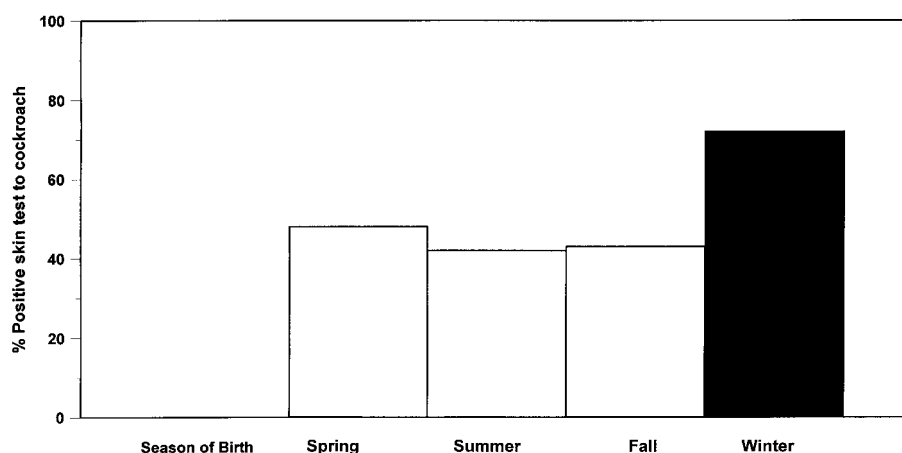


FIG. 1. Rate of cockroach allergen skin test reactivity related to season of birth. Children at risk in each season: winter = 32, spring = 33, summer = 50, and fall = 44.

with asthma. Our data suggest that sensitization to cockroach allergen occurs in asthmatic children who are born in each of the four seasons of the year. Furthermore, children with asthma born in the winter months were more likely to be sensitized to cockroach allergen compared with children born during the other seasons, even after controlling for potential confounding variables. Kang et al.⁸ have suggested that cockroach-related asthma in Chicago is characterized by exacerbation in the winter season. Seasonality may be a nonspecific finding for atopy. The risk of sensitization may be due primarily to increased indoor cockroach allergen levels, spending a greater part of the day in the home because of the low temperature outdoors, or increased risk of respiratory syncytial virus infection enhancing atopy during these months. Our results do require further validation, and the use of a clinic population may also limit the generalizability of this retrospective study. Based on the point estimates, children born during the winter season are at about 60% increased risk of developing sensitization to cockroach allergen. The clinical significance of such an increase is not known. However, sensitization to cockroach allergen and continuous exposure to the same allergen may be related to asthma morbidity in children.⁹

Because of geographic and sociodemographic variations in the exposure and sensitization to cockroach allergen, the findings in this study may not be true in other locales.⁶ For example, Kemp³ examined the relationship between grass pollen sensitivity and month of birth in 86 New Zealand children and found a relationship between month of birth and pollen sensitization, but Reed¹⁰ found no such relationship in 150 children examined in the United States. However, Warner and Price⁴ and Smith and Springett⁵ independently studied 69 and 1286 children, respectively, in

England, and both studies demonstrated a relationship between time of birth and sensitization to dust mite allergen. The age of the subjects at the time of investigation may be of particular importance because accumulating exposure and environmental experiences can progressively set apart the birth-season influence until this connection disappears, possibly after the age of twenty.² Age was not an important effect modifier in this study, however, possibly because all the subjects were at least 5 but less than or equal to 18 years of age.

Our data suggest that the risk of sensitization to cockroach allergen is increased among asthmatic children born during the winter months in metropolitan Chicago. Hopefully, our findings will stimulate further studies to confirm these results and to increase our understanding of the possible variation in cockroach allergen sensitization with season of birth.

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