

Integrated Pest Management in an Urban Community: A Successful Partnership for Prevention

Barbara L. Brenner,¹ Steven Markowitz,² Maribel Rivera,^{1,3} Harry Romero,³ Matthew Weeks,⁴ Elizabeth Sanchez,³ Elena Deych,¹ Anjali Garg,¹ James Godbold,¹ Mary S. Wolff,¹ Philip J. Landrigan,¹ and Gertrud Berkowitz¹

¹Department of Community and Preventive Medicine, Mount Sinai Medical Center, New York, New York, USA; ²Center for the Biology of Natural Systems, Queens College, City University of New York, New York, USA; ³Boriken Neighborhood Health Center, New York, New York, USA; ⁴Settlement Health, New York, New York, USA

Pesticides, applied in large quantities in urban communities to control cockroaches, pose potential threats to health, especially to children, who have proportionately greater exposures and unique, developmentally determined vulnerabilities. Integrated pest management (IPM) relies on non-chemical tools—cleaning of food residues, removal of potential nutrients, and sealing cracks and crevices. Least toxic pesticides are used sparingly. To evaluate IPM's effectiveness, the Mount Sinai Children's Environmental Health and Disease Prevention Research Center, in partnership with two community health centers in East Harlem, New York City (NY, USA), undertook a prospective intervention trial. Families ($n = 131$) enrolled when mothers came to the centers for prenatal care. Household cockroach infestation was measured by glue traps at baseline and 6 months afterward. The intervention group received individually tailored IPM education, repairs, least-toxic pest control application, and supplies, with biweekly pest monitoring for 2 months and monthly for 4 months. The control group, residing in East Harlem and demographically and socioeconomically similar to the intervention group, received an injury prevention intervention. The proportion of intervention households with cockroaches declined significantly after 6 months (from 80.5 to 39.0%). Control group levels were essentially unchanged (from 78.1 to 81.3%). The cost, including repairs, of individually tailored IPM was equal to or lower than traditional chemically based pest control. These findings demonstrate that individually tailored IPM can be successful and cost-effective in an urban community. **Key words:** children's environmental health, cockroach, community intervention trial, integrated pest management, pesticides, urban built environment. *Environ Health Perspect* 111:1649–1653 (2003). doi:10.1289/ehp.6069 available via <http://dx.doi.org/> [Online 2 July 2003]

Cockroaches, rats, and mice are major problems in the urban built environment. These vermin thrive in multifamily dwellings where excessive moisture, extensive cracks and crevices, abundant food sources, overcrowded closets, and stacks of paper provide them nutrition and shelter.

Pesticides are applied in large quantities in urban communities to control vermin (Landrigan et al. 1999). In 1997, a statewide survey in New York found the two counties that used the largest total amounts of pesticides to be Kings (Brooklyn) and New York (Manhattan) counties. In Manhattan, the total quantity of pesticides applied by commercial applicators in 1998 was 270,633 pounds (Thier 2000). Household studies have confirmed this pattern and have shown repeatedly that chemical pesticide use is common in urban communities (Adgate et al. 2000; Berkowitz et al. 2003; Whyatt et al. 2002). A household exposure survey found that 100% of a population of pregnant women in northern Manhattan and the South Bronx had detectable airborne exposures to each of three insecticides—the organophosphate insecticides diazinon and chlorpyrifos and the carbamate propoxur—as well as to the fungicide *o*-phenylphenol (Whyatt et al. 2002).

Organophosphate pesticides, including those used in urban apartments, appear to be neurodevelopmental toxicants. Studies of organophosphate exposure in laboratory animals, particularly evaluations of exposures in early life, have found associations with developmental delays, hyperactivity, motor dysfunction, behavioral disorders, and brain cell death (Campbell et al. 1997; Dam et al. 2000; Levin et al. 2001). These findings led the U.S. Environmental Protection Agency (U.S. EPA) to restrict residential uses of the organophosphates chlorpyrifos and diazinon, and they have prompted epidemiologic studies of possible neurodevelopmental effects of pesticides in several population cohorts in rural and urban communities in the United States (Berkowitz et al. 2003; Eskenazi et al. 1999; Perera et al. 2002; Whyatt et al. 2002).

Integrated pest management (IPM) is an alternative to conventional, chemical-based pest control (Olkowski et al. 1991). It relies on nonchemical approaches plus education and uses comprehensive information on the life cycles of pests and their interactions with the environment to guide pest control. The concept underlying IPM is that pest populations can be controlled by removing their basic survival elements, such as air, moisture, food, and shelter, by blocking their access to apartments

by sealing cracks and crevices and by the careful placement of least toxic baits and gels. Maintenance, sanitation, education, and training are the cornerstones of IPM. Few systematic studies of IPM have been undertaken in the urban setting. Some have produced positive results, but others report limited success (Campbell et al. 1999; Kass and Outwater 2002; Kinney et al. 2002; Sargan et al. 2002).

In this article we describe the successful implementation of IPM in East Harlem, New York City (NY, USA). The work was undertaken through the Mount Sinai Children's Environmental Health and Disease Prevention Research Center in partnership with Boriken Neighborhood Health Center and Settlement Health, two neighborhood health centers. The study design was a two-armed prevention intervention trial designed to test whether IPM techniques and targeted education at the household level can reduce cockroach infestation and exposure to chemical pesticides in urban households.

Study Design and Methods

Overview. This project, titled Growing Up Healthy in East Harlem, is an intervention trial designed to test whether IPM techniques and targeted IPM education at the household level can effectively reduce cockroach infestation and indoor exposure to chemical pesticides in an urban community. The study contained an intervention as well as a control group. Both intervention and control group families reside in East Harlem, a neighborhood

Address correspondence to B.L. Brenner, Department of Community and Preventive Medicine, Mount Sinai Medical Center, Box 1037, One Gustave L. Levy Place, New York, New York 10029-6547 USA. Telephone: (212) 731-7888. Fax: (212) 731-7887. E-mail: barbara.brenner@mountsinai.org

We thank Assured Environments, Inc., and the East Harlem Community Health Committee, Inc., for their guidance in the planning and design of the community project; the Growing Up Healthy in East Harlem Advisory Board; L. Hill-Barcelona for her leadership in organizing the intervention; and the staffs of the Boriken Neighborhood Health Center and Settlement Health.

This research was supported by the National Institute of Environmental Health Sciences grant 5 P01 ES 09584 and U.S. Environmental Protection Agency grant R 827039-01-2.

The authors declare they have no conflict of interest. Received 18 October 2002; accepted 2 July 2003.