Air Pollution Boosts a Child's Chance of Getting Cockroach-Related Asthma

BY: JENNY MARDER

Cockroach allergens are a major contributor to asthma, particularly in urban areas. Photo by Luis Davilla/Cover/Getty Images.

In New York City's East Harlem, a startling 19 percent of 5-year-olds have asthma, according to a report from the New York City Department of Health. On the Upper East Side, that number drops to a still troubling, but much lower 6 percent. That means that kids growing up in spitting distance of each other have a threefold difference in risk for developing asthma. So why the disparity?

Cockroaches, says Matt Perzanowski of Columbia University, plus a confluence of other factors. Roaches, the most ancient and hardy of pests, are disproportionately found in lower income areas. Older buildings that are more densely packed with people (read: more food sources) are more susceptible to roach infestations. And cockroach allergies are most prevalent in urban areas and inner cities, where the pests are flush.

Cockroaches carry proteins in their saliva, body parts and feces that are a source of powerful allergies. These proteins go airborne where they can be easily inhaled. Allergic reactions can range from a skin rash to an asthma attack. And when compared with other common allergies -- such as dust mites and cats -- cockroach allergies prompt more emergency room trips and more need for medications, said Devid Peden, director of the Center for Environmental Medicine, Asthma, and Lung Biology at UNC School of Medicine.

But cockroaches represent only part of the story. Results from a study published on Feb. 6 in the Journal of Allergy and Clinical Immunology found that exposure to a certain type of air pollution found in diesel exhaust and other combustion-related byproducts can increase the likelihood of developing a cockroach allergy. Researchers studied a common class of
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emitted by the engines of buses and trucks and through the use of residual oil, a cheap oil that's burned for home heating in about 1 percent of Manhattan homes.

In this 1955 photo, an employee looks at a cockroach in a jar on a shelf full of cockroaches in jars in an entomological laboratory. Photo by Al Barry/Three Lions/Getty Images.

That risk, the study found, is even greater in people with a common mutation in a gene called GSTM.

"Asthma research has been going on for a long time, and we haven't found a smoking gun for why asthma has increased," said Perzanowski, the paper's lead author. "This isn't a smoking gun. What it suggests is that this is a complicated story."

They also found that exposure during a mother's pregnancy -- while the child's immune system is developing -- can put the child at much greater risk for developing a cockroach allergy, which, in turn, heightens their risk of developing asthma.

Researchers spent 15 years tracking hundreds of women from pregnancy through the first seven years of their child's lives. The study focused on non-smoking women living in the South Bronx and Northern Manhattan. Scientists collected dust from the beds and kitchens of these women during their third trimester of pregnancy and again when the children were 1, 3 and 5 years old. All dust samples were tested for the cockroach allergens. Researchers also sampled the air for the presence of polycyclic aromatic hydrocarbons and took blood tests to check for the GSTM1 gene mutation and allergies.

Of the homes tested, 80 percent tested positive for high levels of the cockroach allergen. By age 7, 82 children, or 31 percent tested, had the cockroach allergy.

Interestingly, in most cases, high levels of the cockroach allergen only led to allergy in children whose mothers had been exposed to combustion byproducts during pregnancy. And the risk was even greater among those with the gene mutation.

Studies have shown that diesel exhaust, a source of PAH, shifts the immune response so that you're more highly allergic, Peden said. The GSTM gene mutation, known as GSTM1, plays a role in the body's ability to detoxify these
pollutants. And it’s an extremely common mutation -- as many as 40 percent of people have it.

“GSTM1 is found across genders and ethnicities,” Peden said. “The race risk is the human race. It’s a pretty huge polymorphism that results in a pretty big chunk of the population.”

“Being allergic to cockroaches is one of the number-one risk factors for asthma, and it’s important to know what leads to the allergy,” Perzanowski said. “Exposure is happening really early in life. So intervention would have to happen really early in life.”

Protection could include pest management, sealing holes in walls so that cockroaches can’t get through, getting rid of food sources and limiting exposure to combustion byproducts.

“The importance of this paper is that it shows that it’s not any one thing -- it’s a complex mix of common things that when you put them together increases the risk of becoming allergic,” Peden said. “One of the big deals here is that it’s a combination of cockroach exposure and pollutant exposure in a large population.”