

Bacteria in Household Dust May Trigger Asthma Symptoms

By NIH

New research shows that bacteria lurking in household dust produce chemicals that may trigger asthma and asthma-related symptoms such as wheezing. These bacterial chemicals, called endotoxins, particularly those found on bedroom floors, were linked with increased respiratory problems in adults. This study, supported by the National Institute of Environmental Health Sciences (NIEHS), a part of the National Institutes of Health, is the first nationwide study of endotoxins in the household environment, and it involved analysis of more than 2,500 dust samples from 831 homes across the U.S.

Researchers at NIEHS and the University of Iowa found a strong association between endotoxin levels and the prevalence of diagnosed asthma, asthma symptoms, asthma medication use, and wheezing. These relationships were strongest for bedroom floor and bedding dust. Households with higher endotoxin concentrations experienced higher prevalence of respiratory symptoms.

Endotoxins are found in the cell wall of bacteria and are only released when bacteria ruptures or disintegrates. Because bacteria can be found everywhere in the home, the likelihood of their release is high. Once released, endotoxins can cause inflammation of the airways and lead to asthma symptoms.

The study, published online in the American Journal of Respiratory and Critical Care Medicine, was conducted using samples from The National Survey of Lead and Allergens in Housing (NSLAH).

Two research assistants visited each household, administered a detailed questionnaire, conducted a home inspection, and used a standardized protocol to collect samples. Dust samples were collected from bedroom, kitchen and living room floors, bedding, and upholstered furniture and assayed for endotoxin. A disease association analysis was performed to correlate endotoxin concentrations to specific health outcomes.

"When we analyzed the dust samples, we found that kitchen and living room floors had the highest concentrations of endotoxin," said Darryl C. Zeldin, M.D., a Senior Investigator at NIEHS. "However, when we looked at where the health impact of the dust was the most significant, we found that the likelihood of having recent asthma symptoms was nearly three times greater among individuals with exposure to high levels of endotoxin in the bedroom."

The researchers found that all dust samples contained detectable levels of endotoxin. The average concentration of endotoxin ranged from 80.5 units per milligram of dust on kitchen floors to 18.7 on bedding. Family room floors had endotoxin concentrations of 63.9 units per milligram of dust; sofas had concentration levels at 44.8; and 35.3 units on bedroom floors.

"Interestingly, endotoxin exposure worsens asthma symptoms in adults, regardless of whether an individual has allergies or not," said Peter S. Thorne, Ph.D., a researcher at the University of Iowa and lead author on the paper. "This suggests that exposure to endotoxin increases asthma risk even in non-allergic individuals."

Since the mid 1960s, researchers knew that house dust contains endotoxin, but it is only within the last five years that they began to understand the impact of household endotoxin on human health. Knowing what triggers asthma, whether it is endotoxins or something else, may help a physician better prevent or treat symptoms.

"This study implies that it is not just the concentration of the endotoxin that matters," added Dr. Schwartz, Director of NIEHS. "Understanding how factors such as duration of exposure, timing of the exposure, and genetic factors, contribute to the development of diseases like asthma will lead to new insights into how to prevent and treat this important disease." NIEHS is implementing new studies to better understand the role that the indoor environment plays in the development and severity of asthma.