

Endotoxin Exposures and Respiratory Health in Young Children

What is endotoxin and how are we exposed to it?

Endotoxin is a biologically active lipopolysaccharide (LPS), one of a family of molecules that compose the outer membrane of gram-negative bacteria. It can be detected in the presence of gram-negative bacteria whether or not the bacteria are alive. Since gram-negative bacteria are ubiquitous in our environment, the population is constantly exposed to low levels of endotoxin. Endotoxin can be found in high concentrations in organic dusts such as those found in agricultural settings, in air pollution, and in household dusts in both rural and urban homes. These dusts—found on surfaces and in carpet, soils, and grain—can be aerosolized, raising the possibility of higher exposures to small children.

Does inhalation of endotoxin cause asthma in children?

In children with asthma, respiratory symptoms can become more severe with the inhalation of endotoxin because exposure can exacerbate airflow obstruction and inflammation. Although not all children exposed to endotoxin and other environmental allergens will develop asthma, these health effects may be aggravated in children who have allergies. Recent NIEHS-supported research demonstrated that certain mutations in endotoxin response genes can alter the body's ability to respond to environmental triggers. Research is now being conducted to determine if exposure to endotoxin can cause asthma in very young children.

NIEHS-supported research on endotoxin and childhood asthma

- Discovery of mutations in genes that affect human response to environmental endotoxin
- Mechanisms of endotoxin toxicity to the lung and other organ systems
- Research to measure the concentration of endotoxin in indoor and outdoor air in urban and rural locations
- Epidemiologic studies to determine whether endotoxin is associated with increased asthma risk and how this risk is modulated by other asthma risk factors
- Genetic research to determine the prevalence of genetic polymorphisms of genes that modulate response to endotoxin in diverse human populations
- Follow-up studies of birth cohorts of children predisposed to asthma to determine when these children become sensitized to endotoxins and other allergens
- Studies of gene and environment interaction of asthma in young children

The NIEHS supports research on endotoxin and other triggers of respiratory disease in children via investigator-initiated research and its national program of Centers for Children's Environmental Health and Disease Prevention Research, supported jointly with the U.S. Environmental Protection Agency (see <http://www.niehs.nih.gov/dert/programs/translat/children/children.htm>). For more information, contact Gwen Collman, Scientific Program Administrator, at collman@niehs.nih.gov.