Research improves health for people with asthma

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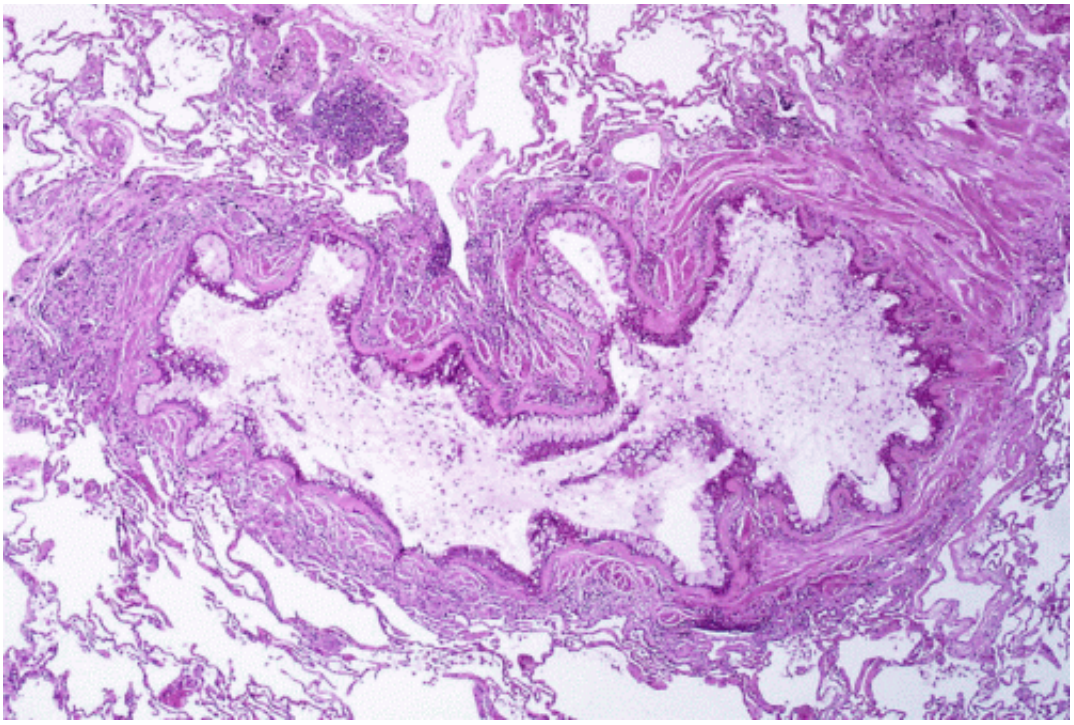

Obstruction of the lumen of a bronchiole by mucoid exudate, goblet cell metaplasia, and epithelial basement membrane thickening in a person with asthma. Credit: Yale Rosen/Wikipedia/CC BY-SA 2.0

May is Asthma Awareness Month, and the National Institutes of Health is finding solutions to improve the health of the nearly 25 million people in the United States who currently have asthma. In recent decades, the prevalence of asthma has been increasing, resulting in millions of urgent

medical visits and missed days of work and school each year.

Asthma is a chronic, and sometimes fatal, disease in which the airways become inflamed from a variety of triggers in the air, like indoor allergens from dust mites, mold, and cockroaches, and outdoor air pollution. Once the airways become swollen and inflamed, they become narrower, causing symptoms such as wheezing, coughing, chest tightness, and difficulty breathing.

Together, three institutes lead asthma research at NIH: the National Institute of Environmental Health Sciences (NIEHS), the National Heart, Lung, and Blood Institute (NHLBI), and the National Institute of Allergy and Infectious Diseases (NIAID). These three institutes support different aspects of asthma research but are united in a commitment to reduce the burden of this debilitating disease, as highlighted here through recent studies funded collaboratively by all three institutes.

For example, research funded by NIEHS, NHLBI, and NIAID has demonstrated the importance of healthy school environments. A study of students from inner-city schools, published in January 2017, linked airborne mouse allergens at schools to increased symptoms and decreased lung function in asthmatic children. This suggests there are steps schools can take to improve air quality and potentially benefit children with asthma.

In fact, a preliminary study tested high-efficiency particulate air filters, commonly known as HEPA filters, in three urban elementary schools, which yielded two indoor air quality improvements: about a 40 percent reduction in fine dust particles, along with about a 55 percent reduction in traffic-related black carbon levels. Both pollutants can irritate the lungs of people with asthma.

NIH-supported researchers also are evaluating how much outdoor air

pollution may come inside school buildings. One study found that levels of traffic-related black carbon were lower inside than outside, but when outdoor levels increased, so did the indoor levels. Fine dust particles inside schools came from both indoor and outdoor sources.

In addition to studying school environments, research funded by NIEHS, NHLBI, and NIAID has explored the complex role of the immune system in asthma. A study published in 2016 showed that children exposed to a wide range of bacteria and microbes, as found in dust on traditional Amish farms that use animals rather than machines, may be protected against asthma through the stimulation and shaping of non-specific, or innate, immune responses.

The study also took genetic factors into account by comparing genetically similar Amish and Hutterite children who live in communities with different agricultural practices. The researchers further strengthened the findings by reproducing the observed protective effect in mouse studies. The difference in triggering of the innate immune response may help explain why asthma remains rare among the Amish but affects nearly 1 in 10 U.S. children, who typically do not live in a rich microbial environment.

While bacteria and microbes can benefit the immune system, exposure to mold may make asthma worse. Scientists funded by NIEHS, NHLBI, and NIAID showed that children with high exposure to molds and fungi were more likely to have asthma at age 7. For children with allergies, the association was especially strong.

NIH-supported scientists continue to work to prevent and treat asthma. This month, we honor those children and adults who face the challenges of asthma every day, those who participate in clinical studies, and the researchers and health care professionals who help to address this condition.