

Diesel exhaust filtered of its tiny particles may worsen allergy-induced lung impairment

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Filtered diesel exhaust linked to greater lung impairment than unfiltered diesel exhaust. Credit: ATS

Air pollution from diesel engines may worsen allergy-induced lung impairment more when tiny particles are filtered from the exhaust than

when they are not, according to new research published online in the American Thoracic Society's *American Journal of Respiratory and Critical Care Medicine*.

This surprising result may be due to the fact that some particle-depletion technologies, including the one used by the researchers, increase the amount of nitrogen dioxide (NO₂) in the exhaust. NO₂, which is subject to national air quality standards, has been shown to reduce lung function and may be a cause of asthma in children.

In "Particle Depletion Does Not Remediate Acute Effects of Traffic-Related Air Pollution and Allergen," Denise J. Wooding, MSc, and co-authors report on a randomized, controlled study of 14 non-smoking adults who were sensitive to at least one of three common allergens.

"We previously demonstrated that [diesel exhaust](#) augmented allergic responses as well as airflow declines in those genetically susceptible, but we wondered if removing particles from the exhaust would lessen these effects," said senior study author Chris Carlsten, MD, MPH, professor, head of respiratory medicine and Canada Research Chair in Occupational and Environmental Lung Disease at the University of British Columbia.

In this cross-over study, all 14 participants at various times were exposed in a laboratory to air with just the allergen, the allergen plus [diesel](#) exhaust and the allergen plus filtered diesel exhaust. They all also breathed air with no diesel exhaust or allergen, which served as the control.

After each exposure, the participants underwent a commonly used test called methacholine challenge to determine how a patient responds to an inhaled allergen. Neither they nor those conducting the study were aware of which exposure they had undergone before being tested.

The researchers also measured numbers of white blood cells, which marshal the body's immune response but can "overreact" to allergens, causing [breathing problems](#).

The study found:

- The particle-depleted diesel exhaust produced by HEPA filtration and electrostatic precipitation generated higher NO₂ levels than unfiltered diesel exhaust.
- Exposure to filtered diesel exhaust and allergen impaired the amount of air participants could forcibly exhale in one second (FEV₁) more than allergen alone and more than unfiltered diesel exhaust and allergen.
- Increasing levels of white blood cells were associated with declining FEV₁ scores, suggesting that white blood cells "play a meaningful role in reducing lung function in the context of these exposures."
- The effects of filtered diesel exhaust on [lung function](#) and on [white blood cells](#) were more pronounced in those participants who were genetically susceptible to oxidative stress, which occurs when there is an imbalance of free radicals and antioxidants in the body.

"The take-home message," said Dr. Carlsten, "is that technologies that remove particulate matter from diesel exhaust cannot be simply assumed to be beneficial to health, especially in susceptible populations."

Provided by American Thoracic Society

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