

Filtered diesel exhaust may worsen allergy-induced lung impairment more than unfiltered exhaust

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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 from The University of British Columbia (UBC).

The study, co-authored by AllerGen trainee Denise Wooding, a master's student in experimental medicine at UBC, was published online this week in the American Thoracic Society's [*American Journal of Respiratory and Critical Care Medicine*](#).

The 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.

"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 Dr. Chris Carlsten, an AllerGen investigator, and professor and head of respiratory medicine and Canada Research Chair in Occupational and Environmental Lung Disease at UBC.

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

For the study, researchers conducted a randomized, controlled study of 14 non-smoking adults who were sensitive to at least one of three common allergens. All 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 eliciting a reduction in lung function in the context of these exposures.
- The effects of filtered diesel exhaust on lung function and on white blood cells was more pronounced in those participants who were genetically susceptible to oxidative stress, meaning an imbalance in free radicals and antioxidants in the body.

About AllerGen NCE

[AllerGen NCE Inc.](#) is a national research network dedicated to improving the quality of life of people suffering from allergic and related immune diseases. Funded by the Government of Canada through the federal Networks of Centres of Excellence (NCE) Program, the Network is hosted at McMaster University in Hamilton, ON.

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Media Contacts:

Kim Wright
Director, Communications and Knowledge Mobilization
AllerGen NCE Inc.
kimwright@allergen-nce.ca
905-525-9140 ext. 26641