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**UCLA Study Suggests that Air Pollutants Alone May Cause Acute Asthma Attacks**  
*Early Research in Animal Model Develops New Testing Method*

UCLA researchers show for the first time that diesel exhaust particles alone may be enough to induce acute asthma flares. A new testing method in an animal model helped researchers better isolate the effects of diesel exhaust particles – a component of air pollution - on asthma.

“Previously, we thought that air pollution alone was not enough to incite acute asthma attacks, but also required the presence of allergens such as pollen or house dust mites to establish airway inflammation and allergic responses in the airways,” said Dr. Andre Nel, principal investigator and professor of medicine in the Division of Clinical Immunology and Allergy, David Geffen School of Medicine at UCLA. “However, this new experimental study shows that we need to pay closer attention to the intrinsic abilities of the air pollutant particles to induce asthma.”

The study, appearing in the November 2003 issue of the Journal of Allergy & Clinical Immunology, will enhance research methods and lead to a better understanding of the epidemiologic observation that sudden surges in air pollution levels induce acute asthma attacks. Researchers at the Mayo Clinic in Scottsdale, AZ collaborated with UCLA on the study.

Asthma affects 15-20 million people in the United States, with the largest increase in school age children. Asthma is a chronic inflammatory disease of the small airways in the lung, and can trigger acute episodes of airway tightening and wheezing.

Researchers gave mice a surrogate allergen, which would be similar to exposing humans to an allergen such as pollen. After waiting several days, researchers followed with aerolized diesel particles, simulating the inhalation of air pollution particles, which quickly resulted in an acute asthma-like condition. From a research perspective, this is the first time that the asthma-promoting effects of the diesel particles could be separated from the potent effects of allergens.

Once this principle was demonstrated, it showed that if the initial exposure to the allergen is downscaled into a weakened allergic response, that the aerosolized diesel exhaust particles could also induce an asthma-like condition. Researchers next tested the aerolized diesel particles on genetically modified mice that have chronic airway inflammation, even in the absence of an allergen. The diesel particles also caused acute asthma attacks in this setting.

According to Nel, the ability of the diesel particles to cause asthma flares after the allergen effect has diminished or in the absence an allergen, demonstrated that air pollution may play more of a role than previously thought in acute asthmatic events.

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Acute asthma attacks are difficult to reproduce in a research setting. Previous animal models in which diesel exhaust particles were tested, took weeks to induce an asthma-like condition, and then it was difficult to decipher to what extent the pollutant particles, allergens or other factors contributed to the airway inflammation.

This study introduces new and more rapid screening models that better isolate the biological mechanisms behind an acute asthma attack. This technological advancement may allow researchers to develop an explanation for the acute asthma flares, which follow within hours after a single pollution event. Nel notes that this will also be helpful in testing the effectiveness of asthma medications on air pollution.

For the next step, researchers will look more closely at the mechanisms by which air pollution induces airway inflammation, as well as to see if this same response occurs in humans. The researchers will also employ new particle concentrator technology, developed by Dr. Constantinos Sioutas at USC, to collect real-life ambient particles in the Los Angeles basin to reproduce diesel exhaust particles effects in animals, noted Nel.

This study builds on the growing body of airborne pollution research at the David Geffen School of Medicine and the Southern California Particle Center & Supersite at UCLA. Another recent study from these researchers and their colleagues, published in *Environmental Health Perspectives*, linked real-life ambient particles, collected by particle concentrators in the Los Angeles basin, to cell damage. That study also highlighted the fact that it is the very smallest particles, known as ultrafine particles, that penetrate the deepest into tissue and cause the most damage.

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