



## CLEAN AIR RESEARCH PROGRAM

### RESEARCH EXPLORES WHY SOME PEOPLE ARE MORE SENSITIVE TO AIR POLLUTANTS

**Issue:**

The Clean Air Act requires the U.S. Environmental Protection Agency to set air pollution standards to protect human health. However, there is wide disparity in people's susceptibility to air pollutants and the intensities of their reactions to them.

The National Ambient Air Quality Standards (NAAQS) are designed to protect the most vulnerable populations from outdoor air pollutants. Identifying these groups more precisely and understanding why they are more susceptible is of great importance to scientists and policy makers.

While multiple studies suggest a direct relation between outdoor air pollution and an increased risk of cardiopulmonary events or diseases, segments of the population appear far more

vulnerable or responsive to these pollutants. The elderly and the very young, for example, have been found to be more vulnerable to pollution's effects.

The collective evidence garnered from epidemiological, clinical, and toxicological studies indicates a range of responsiveness that can vary in both kind and degree. In fact, sensitivity can be several-fold higher in the case of particulate matter (PM) or ozone. Characterization of this enhanced sensitivity and its underlying causes will aid in the development of appropriate standards or intervention strategies to mitigate risk to more susceptible populations.

**Science Objective:**

The Clean Air Research Program in EPA's Office of Research and Development (ORD) provides the

science to better define the individual elements that lead to higher susceptibility to air pollution. Primary elements for consideration include (but are not limited to) differences in dose, age, disease, behaviors such as exercise, or genetic predispositions.

ORD researchers are studying how and why these characteristics contribute to an increased risk of adverse effects in response to air pollutants. Other factors such as socio-economic status and living conditions are also being examined.

ORD research activities include the following:

- Studying the airborne contaminant effects on adult and pediatric populations
- Investigating differences between elderly versus younger

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asthmatics and appropriate animal models in response to ozone and PM exposures

- Evaluating the use of antioxidants to mitigate the effects of PM in healthy young and elderly individuals
- Investigating animal models of defined sensitivities to assess the impact of pollutants or their causation of chronic cardiopulmonary diseases
- Identifying adverse health effects of PM on people and animal models with underlying cardiopulmonary and related diseases
- Identifying the genes involved with increased susceptibility to air pollutants
- Identifying changes to respiratory and cardiac cells in human, animal and in vitro models exposed to PM

### **Application and Impact:**

Research by the Clean Air Research Program is improving the ability of EPA and others to identify and characterize populations more susceptible to airborne contamination. As susceptible populations are better defined, and the root biological

mechanisms of higher susceptibility are revealed, information on specific risk factors is used to advise susceptible individuals on ways to protect their health. This information is also used to evaluate and develop air pollution policies and guidelines. For example, research has:

- Supported a decision by California to pass legislation restricting the location of new schools near major roadways
- Supported New York City's rule that bus fleets must convert to clean diesel fuel sources
- Provided the scientific foundation for the development of guidelines by the National Asthma Education and Prevention Program (NAEPP), which recommends clinicians advise asthma patients to avoid exertion outdoors when levels of air pollution are high. URL: <http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.htm>
- Provided scientific data used to develop protocols for

conducting the National Children's Study

### **REFERENCES**

Selgrade MK, Plopper CG, Gilmour MI, Conolly RB, Foos BS. Assessing the health effects and risks associated with children's inhalation exposures—asthma and allergy. *J Toxicol Environ Health A*. 2008;71(3):196-207.

Alexeeff SE, Litonjua AA, Wright RO, et al. Ozone Exposure, Antioxidant Genes, and Lung Function in an Elderly Cohort: VA Normative Aging Study. *Occupational and Environmental Medicine* 2008;doi:10.1136/oem.2007.035253.

O'Neill MS, Veves A, Sarnat JA, Zanobetti A, et al. 2007. Air pollution and inflammation in type 2 diabetes: a mechanism for susceptibility. *Occup Environ Med* 64: 373-379.

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