



CLEAN AIR RESEARCH PROGRAM

PM RESEARCH CENTERS ADVANCE RESEARCH ON PARTICLE POLLUTION

Background:

The U.S. Environmental Protection Agency's research on particulate matter (PM) in the Clean Air Research Program has contributed significantly to today's understanding of the cardiovascular and respiratory health risks of PM, and the potential for other human health effects associated with exposure to these regulated air pollutants.

In 1998, Congress directed EPA to establish five multi-disciplinary PM Research Centers at universities across the country. These Centers were funded for five years, beginning in 1999, through EPA's STAR grants program.

Since their creation, the initial PM Research Centers have conducted important research to significantly reduce scientific uncertainties related to health effects associated with exposure to fine particles. As a result, EPA

held a second competition through which EPA renewed funding at three Centers and initiated two new Centers with funding through 2010. A third competition is being planned that would fund research centers from 2010-2015.

Science Objective:

The goal of the PM Research Centers, a part of the Clean Air Research Program, is to use integrated approaches to study priority issues related to airborne PM, including susceptibility, mechanisms of health effects, exposure-response relationship, and source-to-health linkages.

Current PM Research Centers:

- EPA Center for Ambient Particle Health Effects, Harvard University
- Johns Hopkins Particulate Matter Research Center, Johns Hopkins University

- The Rochester PM Center, University of Rochester
- The Southern California Particle Center, University of Los Angeles
- The San Joaquin Valley Aerosol Health Effects Research Center at University of California – Davis

Descriptions of the Centers and links to reports, publications, and web sites are available at: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/outlinks.centers#19

Application and Impact:

The PM Centers are scientific leaders in advancing the field to understand the health effects of particle pollution, providing a substantial body of research that has been prominent in regular scientific reviews of the air quality standards for PM.

The research has assisted government officials with the

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development and implementation of public health and air quality policies. For example, PM Center research suggesting a link between exposure near roadways and health effects helped support a California policy in which schools must be sited at least 500 feet away from freeways. The PM Centers also conduct research addressing health impacts associated with particle size and composition resulting from differential source profiles.

The PM Centers have proven to be leaders in advancing the field of PM epidemiology. Accomplishments include:

Identifying Risks of Ultrafine Particles: The Centers have been leaders in defining health effects associated with exposure to very small particles, known as ultrafine particles, and in characterizing their chemical composition, sources, and atmospheric processing.

Center investigators were among the first to demonstrate that concentrated ultrafine particles are associated with cardiovascular effects, particularly in susceptible

populations. And they have led the way in developing approaches to define some of the basic cellular and molecular pathways by which ultrafine particles affect target organs differently than do fine or coarse particles.

Understanding the Oxidative Stress Link: Increasingly, evidence is pointing to oxidative stress as playing a major role in the mechanisms by which PM causes adverse health effects. Center investigators have made significant inroads to understanding how PM can promote oxidative stress in the body. These studies have changed the way in which most PM investigators view how the pollutant affects the cardiopulmonary system.

Advancing Technology for Clinical Research: The Centers have been leaders in developing new technology and techniques for use in conducting clinical studies on human and animal PM exposures. Additionally, PM Center researchers have developed devices to monitor personal environmental exposure to coarse and ultrafine PM.

Understanding Health Effects Associated with Sources of PM: The Centers have played a key role in understanding the health effects caused by specific sources of PM such as power plants, diesel engines, airports and shipping ports, and agricultural sources. They were among the first to link specific components and sources of PM with specific biological effects in animals and have been leaders in demonstrating that roadway emissions are of special concern.

Exploring Health Effects: The Centers have expanded understanding of PM associated mortality, the cardiovascular effects related to PM exposure, including stroke, congestive heart failure, and atherosclerosis as impacted by diseases such as diabetes or genetic disposition. The PM Research Centers have also contributed to the understanding of respiratory effects of PM in children.

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