



CLEAN AIR RESEARCH PROGRAM

MEASURING EXPOSURE IMPROVES OUR UNDERSTANDING OF RISKS TO AIR POLLUTANTS

Issue:

The more we know about the relationship between human activities, emissions of air pollutants from various sources, and actual human exposure, the better equipped we are to develop and implement effective air quality management strategies.

Research to understand and measure individual exposures to air pollutants is enabling scientists to link the source of the pollutant and its concentration in the atmosphere to its health effects. This will help to inform decision makers who are working to protect the public from air pollutants at the U.S. Environmental Protection Agency and in states and tribes.

Currently, many air quality regulations are based on studies that use outdoor (ambient) concentrations of air pollution as

surrogates for actual human exposure. Scientists are working to provide more exact measurements of personal exposure.

Personal exposure levels to an air pollutant can vary throughout the day from individual to individual for a number of reasons. A person's location (such as near a highway or in a home), activity level, and even the current atmospheric conditions are factors that contribute to exposure. To develop better measurements of personal exposure, knowledge of the relationship between a person's changing environments and activities within those environments is needed.

Science Objective:

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

research to improve understanding of the factors affecting human exposure to air pollutants. Studies provide insights into how and where people are exposed to air pollutants.

Over the past decade, research has focused on assessing exposures to air pollutants in a variety of residential settings and in people who may be more susceptible to air pollution.

Since people spend a large amount of time indoors, and much of that at home, scientists investigate factors that affect people's exposure in the home environment.

Research studies to understand exposures to air pollutants among more susceptible populations have been conducted with the retired elderly, asthmatic

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CLEAN AIR RESEARCH PROGRAM

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children, adults with hypertension and in heart patients with implanted cardiac defibrillators. Other studies have been conducted with healthy police officers and people who live in varying proximity to industrial and mobile sources.

Scientific questions include:

- Where and when do humans come in contact with air pollutants?
- What are the human and environmental factors that influence exposure to pollutants?
- How do local and regional sources affect exposure?
- What exposure measurement information is needed to develop or improve human exposure models for air pollution?
- How do measurements of personal, residential, and ambient exposure values relate to one another?

Application and Impact:

Exposure research has advanced our understanding of how people are exposed to air pollution and

how exposure relates to health outcomes. The science informs strategies to reduce the impacts of air pollution and provides important data to develop and improve models for estimating human exposure and interpreting health outcomes.

Advances include:

- Better definition of the relationships between actual personal exposures and outdoor air pollutant concentrations.
- Improved ability of epidemiologists to conduct health studies.
- Fine particulate matter (PM_{2.5}) penetrates easily into indoor environments where people spend much of their time. Very small or large PM or reactive gases don't penetrate well.
- EPA research also has shown that PM exposure in cars is associated with cardiovascular effects in healthy young men.

A major study, called the Detroit Exposure and Aerosol Research

Study (DEARS), has contributed to our understanding of how well air quality information collected at community monitors reflects what neighborhoods and the individuals living in these neighborhoods are exposed to every day.

REFERENCES

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CONTACT

Alan Vette, National Exposure Research Laboratory, EPA's Office of Research and Development, 919-541-1378, vette.alan@epa.gov.

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