



Understanding the Relationships between Air Quality and Human Health

by S.T. Rao

Although there has been substantial progress in improving ambient air quality in the United States, atmospheric concentrations of ozone and fine particulate matter (PM_{2.5}) continue to exceed the National Ambient Air Quality Standards in many locations. Consequently, a large portion of the U.S. population is being exposed to unhealthy levels of ozone and fine particles. In addition, there is concern regarding whether ambient concentrations of PM_{2.5} species and air toxins measured at various continuous monitoring sites across the United States are the appropriate measures for exposure assessment studies, since recent field studies reveal a large spatial variability in their concentrations within urban areas.

It is well known that meteorology exerts a significant influence on the atmospheric concentrations of pollutants. Hence, it is important to assess the weather-induced versus emissions-induced effects on human health. Also, to better understand the beneficial health effects of improving air quality, appropriate data and methods are needed to systematically track changes in pollutant emissions, atmospheric concentrations, human exposure, and human health following regulatory actions. Studies are currently underway

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to help develop better approaches for linking air quality models with exposure models and relating the exposures to health outcomes.

This issue of *EM* presents a series of articles that focus on the relationships between air quality and human health—what we know so far and the challenges that remain. Starting on page 8, Pennell et al. provide an overview of the issue at hand. Following this article is a series of articles by researchers working in government and academia that presents different aspects of the air quality and human health relationships. It should be noted that the views expressed in these articles do not necessarily reflect the views and policies of any federal agency. **em**



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Silver Spring, MD 20910
OFFICE OF OCEANIC AND ATMOSPHERIC RESEARCH

APR 25 2006

Dear Reader:

In fulfillment of its mission of understanding and predicting changes in earth's environment, the U.S. Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) has been providing air quality decision makers with better information and tools for making decisions that have large public health and economic consequences. As a leader in the development of air quality models, NOAA has been improving national air quality forecast capability. NOAA's ozone forecast guidance is being used to help society mitigate impacts of unhealthy pollution levels.

Given the strong connection between air quality and human health, NOAA and the U.S. Environmental Protection Agency (EPA) are working together to improve the accuracy of the ozone forecast and expand forecast guidance to include fine particulate matter for the country as well as expand the forecast interval to several days and beyond. NOAA is pleased that *EM Magazine* is devoting this issue to address the relationships between air quality and human health. In this issue, you will see the combined efforts of NOAA, EPA, and other agencies in addressing this important topic.

Sincerely,

Richard W. Spinrad, Ph.D.
Assistant Administrator



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

September 1, 2006

OFFICE OF
RESEARCH AND DEVELOPMENT

Dear Reader:

Air pollution affects our lives and like the weather, it changes every day. Although Americans are enjoying the best air quality in more than three decades, many are still breathing air that does not consistently meet the nation's health-based air quality standard.

Scientists at the U.S. Environmental Protection Agency's Office of Research and Development are working with other experts at the National Oceanic and Atmospheric Administration, Centers for Disease Control and Prevention, and the air quality science communities to improve exposure and risk assessment models and to strengthen air quality forecasts and public health advisories. These efforts should ultimately lead to fewer citizens being affected by poor air quality.

In this issue of *EM*, you will learn about science underway at the EPA that is advancing protection of public health and the environment. Scientists, regulators, and the public health community are working together to gain a greater understanding of the relationships among air quality conditions and human health impacts through air quality data and models, epidemiological and toxicological studies and estimates of chronic and acute exposures used to assess health risks. These efforts enable us to track relationships between human health and air quality at national and state levels.

Best regards,

George M. Gray, Ph.D.
EPA Science Advisor and
Assistant Administrator

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DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service
Centers for Disease Control
and Prevention (CDC)
Atlanta GA 30333



May 17, 2006

Dear Reader,

This year, the Centers for Disease Control and Prevention (CDC) celebrate its 60th anniversary. Since it was founded in 1946 to help control malaria, CDC has remained at the forefront of public health efforts to prevent and control infectious and chronic diseases, injuries, workplace hazards, disabilities, and environmental health threats. As an expression of its commitment to solve health problems related to the environment, CDC established the National Center for Environmental Health (NCEH) in 1980. Congress created a companion agency, the Agency for Toxic Substances and Disease Registry (ATSDR), in the early 1980s, with a specific mandate to protect the public from toxic chemical releases and hazardous waste. NCEH and ATSDR continue to work together to safeguard the health of populations exposed to environmental hazards. One area of particular concern for public health is the impact of air pollution on asthma and other health effects, especially among vulnerable populations such as our children and the elderly.

The burden of asthma is significant. In 2003, about 20 million Americans had been diagnosed as having the disease and about 11 million people reported an asthma attack within the previous year. A number of environmental factors can trigger asthma episodes, including outdoor pollutants from industrial emissions and auto exhaust. While air quality in the U.S. has improved over recent decades, air pollution remains an important public health problem, in part because of what may be a more susceptible population than in the past. Studies from many large cities confirm that on "bad air days," respiratory symptoms, school absenteeism, emergency department visits, hospitalizations, and mortality all increase. Emerging evidence also suggests that air pollution can impair normal lung growth in children, and trigger the onset of new cases of asthma. Of special concern, not all of us are equally susceptible; poor people and members of minority groups are at increased risk, and these disparities urgently need to be addressed and remedied.

I am pleased this volume of *EM* magazine is devoted to the relationship between air quality and health. Articles discuss issues such as exposure assessment, data linkage, and forecasting that impact our ability as public health practitioners and environmental managers to take action. CDC and the United States Environmental Protection Agency (EPA) have collaborated for years to understand better the relationship between health and air pollution, to target interventions that can prevent and control asthma episodes, and (more recently) to link and track health and environmental data. The success of these efforts depends on the commitment of dedicated environmental and public health professionals not only at the federal level, but at the state and local level also. By leveraging our resources and skills, we can continue to protect the health of all Americans, especially those who are least able to help themselves.

Sincerely,

Howard Frumkin, MD, DrPH
Director
National Center for Environmental Health/Agency
for Toxic Substances and Disease Registry

