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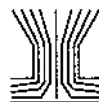
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Guest Editorial

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The Annual Meeting of the American Association for Aerosol Research, which took place June 22–26, 1998 in Cincinnati, Ohio, included a special symposium on “Particulate Matter and Health: Lessons Learned and Energizing the Research Agenda.” The symposium included two plenary sessions, four special platform sessions, two panel discussions, and over 50 platform and poster papers on topics related to particulate air pollution and health. Of necessity, the scope of the symposium was broad because of the difficulties in defining and characterizing particulate matter (PM) and the complexity of the biological issues involved. Topics that were covered included the following:

- 1) PM issues: Looking back and possible paths forward;
- 2) the epidemiological basis for PM standards;
- 3) the EPA’s speciation monitoring network;
- 4) personal exposures to community and indoor PM;
- 5) atmospheric aerosol characterization needs relevant to health effects;
- 6) the plausibility of PM-induced health effects;
- 7) particle-induced lung injury: physicochemical particle characteristics and the influence of age and health status;
- 8) pathogenetics of PM;
- 9) new approaches in multicomponent inhalation toxicology research;
- 10) uncertainties in the health data base;
- 11) PM toxicology;
- 12) dosimetry of inhaled particles; and
- 13) emission formation and control of PM.

These topics effectively frame the important major issues related to the health effects of PM. Each of these topics present opportunities for research as well as new challenges to the aerosol research community. Major increments in PM-related research funding, both short- and long-term, are being provided by numerous funding agencies with an emphasis on studies that are integrated into the larger health related problems.

The special symposium illuminated the substantial magnitude of needed research on PM and health. Numerous epidemiological studies have demonstrated an association between day-to-day measures of community PM concentrations and a variety of adverse health outcomes, including morbidity and mortality. As repeatable as these associations are, toxicology studies have not identified either the causal agent (or agents) or the biological mechanisms by which harm is done. Furthermore, the proper measure, or metric, of PM-associated air pollution that tracks the health effect associations has not been identified. Thus, appropriate air samplers and sampling strategies for PM may not yet exist. An analysis of the research that needs to be performed relating to these and other important issues has been published by the National Research Council (“Research Priorities for Airborne

Particulate Matter: I. Priorities and a Long-Range Research Portfolio," National Academy Press, Washington, DC, 1998). This highly recommended report proposes a 13-year, \$442 million research program directed at ten "highest priority research recommendations." The research portfolio describes a critically important effort on behalf of public health; an effort that will require the enlightened participation of numerous scientists if it is to succeed.

Much is at stake because if modern PM-related exposures are truly responsible for large numbers of deaths and cases of cardiopulmonary disease, then increasingly stringent abatement efforts are likely. These efforts will probably have a very significant impact on the costs and availability of transportation, electricity, food, shelter, and goods, which will affect public health as well as the economies of many nations. The special symposium was motivated largely by this health and economic aspect of particulate air pollution and the realization that aerosol science expertise must be recruited in order to resolve the significant uncertainties.

PM_{2.5} is a very important societal issue and the AAAR is well positioned to have a very positive impact on helping to provide meaningful solutions. This symposium provided an excellent synopsis of current status, but even more importantly provided views on how to maximize research returns in the future by focusing efforts on the most important questions. AAAR offers a unique forum for bringing together aerosol scientists, toxicologists, atmospheric scientists, instrumentation experts, lung biologists, clinicians, and regulatory scientists to work on this multidimensional issue. The general messages from the symposium were the following:

—The data is a compelling indication that there is an association between airborne

urban particulate levels and mortality increases.

- The possible mechanisms for this subtle effect are not likely to be simply determined and tested, but are likely to be complex and multifaceted.
- Gaps in our knowledge of the risks to health from exposure to PM have been identified that include linking sources of PM and PM precursors to what is found in the ambient and indoor environment, the linkage from what is found in air to the dose over time to critical tissues, and, ultimately, mechanistic linkages to specific PM-associated health outcomes.
- Critical thinking needs to go into devising research plans to define approaches to addressing these and other knowledge gaps that are delineated.
- A concerted effort will be needed by scientists working in a multidisciplinary manner to provide meaningful insights to this complex issue, and much of the research is likely to be over a relatively long time span that may not fit easily into legally mandated review periods.

The symposium "Particulate Matter (PM) and Health: Lessons Learned and Energizing the Research Agenda" provided an excellent platform for discussing where we have been on PM_{2.5} science and regulation and provided insights on possible ways to move forward. Arden Pope, who has provided much of the epidemiological data, reviewed this area and summarizes in his paper on this issue the central theme around the strength of the data supporting an association between airborne particle concentrations and increases in mortality. Some of the plausible mechanisms by which inhaled particulates might give rise to observed short-term excesses in mortality were discussed. Specific factors including response to ultrafine particles, age, oxidative stress, inflammation, and cardiovascular phenomena are among the possibilities.

There were also in-depth discussions of topics including indoor/outdoor exposure, examination of which PM indicators should be measured, sampling issues and technology, control technology, epidemiological needs from aerosol scientists, health effects, and atmospheric transformation and modeling. The papers in this issue provide a sampling of some of these topics that were discussed. Because of the magnitude

of the issue, the papers in this special issue cannot come close to addressing all of the above issues, but they do present relevant initial thinking and research efforts. The most important aspect of the conference was the exchange of ideas and information among many disciplines so that improved research efforts may be defined and undertaken taking into account the complexity of the issue.