Particulate matter and human health focus issue

Three years ago, *Environmental Science & Technology*'s Editor-in-Chief, Jerry Schnoor, wrote an editorial "Carol Browner's Legacy: $PM_{2.5}$" detailing her decision as EPA administrator to move forward to regulate fine particulate matter, or $PM_{2.5}$ (particulate matter with a diameter <2.5 μm) in spite of the many uncertainties. That editorial noted that the evidence at that time strongly suggested that she got the fine particulate matter question right, and that millions of people are now benefitting from her actions. Deciding to regulate was just one aspect of the $PM_{2.5}$ issue EPA got right. Another was how they went about dealing with the uncertainties plaguing the issue at that time. EPA dramatically increased PM research funding, and likewise started a program to track and aggressively monitor both $PM_{2.5}$ mass and composition.

Fruits of the increased worldwide research and monitoring are now evident, as articles in this Focus Issue on PM and Human Health, and elsewhere, attest. We, the co-editors of this issue, have just returned from the Health Effects Institute meeting, where the range of studies discussed highlight the international recognition as to the severity of this problem. Presentations at the meeting captured how much we have learned and how much we still don't know about the linkage between these tiny little particles floating around in the air and human health.

Epidemiologic studies continue to find associations between PM and various health endpoints, including respiratory and cardiovascular ailments. There is increasing evidence that particles' chemical properties and composition are important: oxidative stress, related to the organic fraction and/or metals, is increasingly evidenced as a viable mechanism to explain at least some of the epidemiologic findings. Conversely, the relative importance of the various ranges of particles is still very much up in the air (pun intended).

Many messages that came out of the meeting and are further considered in this issue concern PM associated with vehicular sources. For example, non-exhaust automobile PM emissions, i.e., particles derived from brake and/or tire wear and re-suspended dust, may be responsible for some of the findings. This is of concern, in part, because unlike tailpipe emissions, which have dropped faster than distances driven have increased, (currently) uncontrolled non-exhaust emissions will continue to increase as the number of vehicles and the distances driven increase. Another message relates to ultrafine particles (<100 nm in diameter), which are very difficult to measure or model accurately. These "nano" particles pose a serious concern in urban areas where motorized traffic is the major source. Epidemiologic studies appear to indicate that these elusive particles contribute to adverse health effects in the urban environment, especially for subjects living close to busy roads. Fortunately, there is also good news: a recent major study found that life expectancy increased most in those U.S. counties that experienced the largest reductions in $PM_{2.5}$ over the past twenty years.

While the focus of the articles in this issue primarily address how PM impacts human health, it is important to note the impact of PM on the *planet's* health. The largest uncertainties in climate modeling are related to PM, and a particular concern is the role that black carbon plays in absorbing light, both in the atmosphere and when deposited on snow. On the other hand, there is some consideration as to using PM to help stave off warming, if it is of the reflective sort. There is little doubt that Ms. Browner's new role as Assistant to the President for Energy and Climate Change will see her dealing with PM, and uncertainty, again.

Bert Brunekreef, after finishing high school in 1971, enrolled in Environmental Sciences at the University of Wageningen, the Netherlands. He obtained his bachelors (1975) and masters (1979) degrees both with honors, specializing in air pollution and environmental health. During this period, he spent four months at the EPA monitoring laboratory in Las Vegas, NV, working with Dr. Joseph Behar and others at the Las Vegas EPA facilities. From 1979 to 2000, he was employed by the Department of Environmental and Tropical Health (later: Department of Environmental Sciences) of the Wageningen University, first as assistant professor, since 1986 as an associate professor, and since 1993 as full Professor. In 1986/87, he spent the academic year at the Harvard School of Public Health studying the health effects of air pollution episodes and that of living in damp homes. During that period, he closely collaborated with Douglas W. Dockery, Frank E. Speizer, James H. Ware, Benjamin G. Ferris, and John D. Spengler. Having served for several years as an International Society for Environmental Epidemiology (ISEE) councillor, Prof. Brunekreef served as the main organizer of the 1995 ISEE/ISEA annual conference, held in the Netherlands that year; in 1998, he was chosen as president of the Society for 2000−2001. Since the early 1990s, Prof. Brunekreef has coordinated four EU

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funded studies (PEACE, TRAPCA, AIRALLERG, and AIRNET) in the field of air pollution, allergy, and health, and partnered in many other international collaborative studies including as PI on two funded by the U.S. Health Effects Institute. In 2000, his Wageningen Environmental and Occupational Health Department was moved to Utrecht University where it merged with the existing Research Institute of Toxicology (RITOX) Division to create the Institute for Risk Assessment Sciences (IRAS), which further absorbed the Department of Food Safety and Veterinary Public Health in 2005. Prof. Brunekreef has been the Director of IRAS since January 1, 2005, overseeing about 150 employees. Prof. Brunekreef is currently Professor of Environmental Epidemiology in both the Faculty of Veterinary Medicine and the Faculty of Medicine at the Utrecht University.

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