

Sign Up Now for HEI's Annual Conference 2015

How do the energy choices we make influence our future health? How do air toxicants affect the brain? What are the newest approaches to reducing emissions that impact health and contribute to global climate change? These and other intriguing questions will be explored at HEI's 2015 Annual Conference on May 3–5 in Philadelphia, Pennsylvania. Scientists, institute sponsors, and policymakers from around the globe will join HEI at the Sheraton Philadelphia Society Hill Hotel for interactive sessions featuring the latest research on air pollution and health. Topics will include the following:



A statue of John Barry, "father of the American Navy," outside Philadelphia's Independence Hall.

PHOTO BY JIM MCWILLIAMS FOR PHILADELPHIA CONVENTION AND VISITORS BUREAU

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Major Report on Newest Diesel Engines

No Evidence of Lung Cancer in Rats after Lifetime Exposure to New-Technology Diesel Exhaust

Results from the final phase of HEI's Advanced Collaborative Emissions Study (ACES), the first comprehensive evaluation of lifetime exposure of rats to exhaust from diesel engines designed to meet strict U.S. emissions regulations enacted in 2007, showed no evidence of lung tumors. The study also confirmed that concentrations of particulate matter (PM) and toxic air pollutants are substantially lower in such "new-technology diesel exhaust" (NTDE) than in traditional-technology diesel exhaust (TDE). The results are described in HEI Research Report 184, *Advanced Collaborative Emissions Study (ACES): Lifetime Cancer and Non-Cancer Assessment in Rats Exposed to New-Technology Diesel Exhaust*, published in January.

The ACES results are expected to play an important role in future risk reviews of diesel engines by international and U.S. agencies. "We are already seeing a transition on America's roads, with over 30% of the trucks and buses in use today meeting the new standards, and the trend is growing in Europe as well," said Dan Greenbaum, HEI president. "These results confirm the great strides that government and industry have made to reduce diesel risk — and argue for even greater efforts to accelerate the replacement of older diesel engines."

In this concluding stage of ACES, known as Phase 3B, investigators exposed laboratory rats 80 hours a week for up to 30 months to emissions from a "new-technology" diesel engine, or a heavy-duty diesel engine meeting stringent 2007 U.S. Environmental Protection Agency standards, which mandate use of new filters and other control technology to significantly reduce PM and most other components of emissions. Earlier phases of ACES, as well as further characterization conducted during



COURTESY OF VOLVO TRUCKS IN NORTH AMERICA

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this phase, established that NTDE has concentrations of PM that are more than 90% lower than the levels found in TDE and that its concentrations of volatile and PM-associated organic species are more than 80 percent lower. Evaluation of the effects of lifetime exposure in rats was a key feature of ACES because the results could be compared with the findings of several older studies that evaluated long-term exposure to TDE.

Phase 3B comprised four studies: a core study, led by Jacob D. McDonald of the Lovelace Respiratory Research Institute, Albuquerque, New Mexico, and three ancillary studies, led by Jeffrey C. Bemis of Litron Laboratories, Rochester, New York; Lance M. Hallberg of the University of Texas Medical Branch, Galveston, Texas; and Daniel J. Conklin of the University of Louisville, Kentucky. In the core study, exposure atmospheres were evaluated and more than 100 biologic measures were assessed. McDonald and colleagues sent samples from exposed rats and mice to the Bemis, Hallberg, and Conklin teams, who evaluated additional end points not usually evaluated in prior long-term TDE exposure studies. These included genotoxicity and inflammatory and thrombotic end points.

In contrast to previous long-term exposure studies of TDE in rats, McDonald and colleagues found that lifetime exposure to NTDE did not induce tumors or pre-cancerous changes in the lung and did not increase tumors related to NTDE in any other tissue. A few mild histologic changes were found in the lung; however, these were not pre-cancerous lesions, previously described in long-term exposure studies of rats to TDE. Rather, the effects of NTDE more closely resembled changes noted in rats after long-term inhalation exposure to gaseous oxidant pollutants, particularly nitrogen dioxide — a component of NTDE that is already being further reduced in 2010 and later model-year engines.

The work of Phase 3B was overseen by independent experts on the HEI ACES Oversight Committee, and the investigators' comprehensive description of all findings at the end of the study was subjected to intensive review by a separate expert panel, the ACES

Committee Nominations Invited

During the next 18 months, HEI is anticipating a few vacancies on its Research and Review Committees. HEI invites nominations of recognized scientific experts for committee membership and is particularly interested in candidates with expertise in epidemiology, biostatistics, toxicology, and exposure assessment. Members are appointed by the Board of Directors for a four-year term, renewable once. Nominations may be sent to Rashid Shaikh (rshaikh@healtheffects.org) by February 28. 

Review Panel. The panel concluded that McDonald and colleagues' study of lifetime inhalation exposure to NTDE in rats was careful, comprehensive, and well executed and used appropriate statistical techniques. In addition, the panel considered the ancillary studies to be generally valuable extensions of the ACES core study — no genotoxic effects could be detected, and few effects, of uncertain pathophysiologic significance, were found in the inflammatory and thrombotic pathway end points measured.

An additional panel of experts, the Pathology Working Group, evaluated the histopathologic data collected and confirmed the major observations reported by the investigators. This group also evaluated the ACES 3B histologic findings side by side with findings from prior long-term studies of exposure to TDE and oxidant gases. These comparative findings are included in the report. 

For more information about HEI Report 184 and HEI's review of the ACES Phase 3B study, contact Geoffrey Sunshine (gsunshine@healtheffects.org).

ANNUAL CONFERENCE (Continued from page 1)

Energy Choices Attention to climate change worldwide and to air pollution in the developing world is growing. This session will cover major trends in energy use and their potential implications for health and climate and look at actions to reduce emissions and enhance energy efficiency in transportation and other sectors.

HEI Update Scientific committee chairs will report on the institute's activities, including the upcoming report from the Diesel Epidemiology Panel, and the 2014 Walter A. Rosenblith New Investigator Award will be presented.

NO₂: New Insights on an Old Pollutant Nitrogen dioxide (NO₂) is derived from combustion sources, including on-road and off-road vehicles, and is among the pollutants for which the U.S. Environmental Protection Agency has established National Ambient Air Quality Standards and the European Union has set limit values. Speakers will

discuss technologies aimed at controlling tailpipe emissions of NO₂ and other oxides of nitrogen and will describe the challenges and successes in lowering NO₂ concentrations in urban areas. Recent evidence on the effects of NO₂ on organs other than the lung will also be presented.

Socioeconomic Status and Response to Effects of Air Pollution Adverse impacts of socioeconomic status (SES) on mortality and morbidity have been observed in diverse populations in many studies, with disadvantaged groups often exposed to higher-than-average levels of pollutants. Speakers will examine the biologic basis for this phenomenon, summarize the role of SES in differences in the observed health effects of air pollution, and discuss ways to measure and account for SES in air pollution studies.

Air Pollution on Our Minds Although effects of some environmental toxicants on the brain have been known for a long time, studies of the effects of air pollution on the

brain at different ages are relatively recent. This session will provide an overview of the mechanisms by which air pollutants may affect the brain and how to study them, what is known about possible developmental effects of exposure during pregnancy and early childhood, and what neurodegenerative diseases may be associated with exposure in adults.

Ultrafine Particles in a Multipollutant World HEI Perspectives 3, *Understanding the Health Effects of Ambient Ultrafine Particles* (2013), concluded that the scientific literature did not support strong conclusions about the independent effects of ambient ultrafine particles (UFPs) on human health. This session will draw lessons from a range of studies on UFPs, traffic exposures, and multipollutant statistical methods for designing effective research strategies. 

Program updates and hotel registration information are available at www.healtheffects.org/annual.htm.

Groundwork for a Research Plan

HEI Panel Studying Shale Oil and Gas Activities Presents Draft Interim Report at Public Workshop

HEI's unique project focusing on oil and gas development in the Appalachian Basin in a national context continued to move ahead this fall, with a special scientific committee releasing a draft interim report in time for review at a December 10 public meeting in Wheeling, West Virginia.

As reported earlier in *HEI Update* (Summer 2014), the institute has received special funding, entirely from private foundations, to explore potential adverse impacts of shale oil and gas development in Pennsylvania, West Virginia, Ohio, and other eastern states and craft a nationally relevant plan recommending priorities for scientific research. The special committee's draft report, *The Potential Impacts of 21st Century Oil and Gas Development in the Appalachian Basin: First Steps Toward a Strategic Research Plan*, lays the groundwork for a final comprehensive research agenda scheduled to be published in mid-2015.

In preparing this preliminary report, the special committee reviewed hundreds of papers, consulted with many experts, and toured gas well sites to better understand current industry practices. Although committee members recognize that new oil and gas operations can generate economic benefits, their focus is to determine what research is needed to support credible, data-driven decision making about potential adverse impacts on people and the environment. The draft report outlines the evolving techniques for producing shale oil and gas and describes the origin and purpose of the committee's project, its approach, and the status of its work. It then summarizes the types of adverse impacts potentially related to oil and gas development.

The committee, an interdisciplinary group of independent experts from inside and beyond the Appalachian region, is tackling

difficult questions through a transparent process that involves public participation throughout, including a series of three public workshops. The first such meeting, held last June in Pittsburgh, Pennsylvania, resulted in a thoughtful exchange among diverse stakeholders, with a common goal of identifying potential adverse impacts for inclusion in the research plan.

At the December workshop, the committee presented and received feedback on the draft report and solicited help in assessing what areas of study should be assigned top priority. Participants, many of whom had taken part in the June workshop, included academic scientists, federal and state officials, representatives of industry working actively in the region, and leaders from nongovernmental organizations evaluating ecologic and human health issues, some of which are working directly with local communities near natural gas operations.

Committee Chair George M. Hornberger, director of the Vanderbilt Institute for Energy and the Environment in Nashville, Tennessee, served as facilitator, and committee member Alison Cullen, an expert in risk-based decision making, moderated the discussion of criteria for prioritizing research needs.

Workshop participants also heard a series of talks that summarized potential adverse impacts on communities and trends in government research on these concerns, as well as trends in unconventional oil and gas industry operations. A special advisor to the committee, Michael Parker, gave one of these talks, drawing on his extensive expertise with hydraulic fracturing — gained while working as a petroleum engineer for more than 30 years.

The objective of the final research plan will be to guide future study of the health, ecologic, environmental, and social implications of oil and gas development in the Appalachian region and across the nation.

"While the near-term goal of the HEI effort is to produce a high-quality research plan,"



Daniel Soeder, National Technology Laboratory, U.S. Department of Energy, at the December workshop.

said HEI Vice President Robert O'Keefe, "this rigorous and inclusive approach — bringing together diverse interests in a science-based forum — is expected to result in a plan that provides the foundation for an independent program of national research jointly supported by government and industry." [HEI]

Slides from workshop presentations and results of participants' recommendations, as well as the draft interim report, are available at www.healtheffects.org/UOGD/UOGDWorkshopDec2014.html. For more information, contact Donna J. Vorhees (+1-617-488-2317; dvorhees@healtheffects.org).

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HEI is a nonprofit organization funded jointly by government and industry to research and evaluate the health effects of air pollution. An overview of HEI, information on its current research program, and all published HEI reports are available for downloading, free of charge, from the Web site.

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2014 Annual Report Now Available



The 2014 Annual Report, *HEI: Building Bridges*, describes HEI's partnership with scientists, government, industry, and the environmental community and its recent work focusing on such topics as whether some sources of particles are more or less toxic than others, the effects on health of emissions from older- and newer-technology diesel engines, and how air pollution factors into health risks around the globe. Download the report at <http://pubs.healtheffects.org/view.php?id=436>. [HEI]



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HEI in the News

South China Morning Post

“Scientists Examine the Health Risks of Hong Kong’s Notorious ‘Street Canyons’” (October 13, 2014)

The *South China Morning Post*, one of Hong Kong’s largest English-language newspapers, reported on an HEI-funded study, now under way, to measure exposure to traffic-related air pollution at more than 100 sites in Hong Kong characterized as “street canyons,” or streets with high-rise, adjoining buildings on both sides, where air pollution tends to concentrate. Benjamin Barratt of King’s College London and colleagues from the University of Hong Kong and the University of British Columbia–Vancouver aim to develop a three-dimensional modeling method that can be translated to other street canyons and megacities in Asia and beyond. “We are assessing how pollution emitted from vehicles is trapped inside street canyons, how this changes with height, and how much enters the homes of residents,” Barratt told the *Post*. The story quoted Barratt as saying the study results “would help planners design buildings that minimize the impact of air pollution on the health of residents.” It quoted officials praising the work, including a spokeswoman for Hong Kong’s Environmental Protection Department and the chief executive of the Hong Kong-based nongovernmental organization Clean Air Network. 



Sharing Knowledge in Sri Lanka

International air pollution experts participated in a breakout session, organized by HEI and the World Health Organization (WHO), on the “Health Impacts of Air Pollution” at Clean Air Asia’s 2014 Better Air Quality meeting in Colombo, Sri Lanka, in November. From left, Carlos Dora, WHO; Dan Greenbaum, HEI president; Wei Huang, Peking University; Aaron Cohen, HEI; and Jeremy Schreifels, U.S. Environmental Protection Agency. 