Most people equate environmental inequity with poor people living next to hazardous waste sites. Yet growing evidence now suggests global warming might be the biggest environmental health injustice of our time. With the rise of Earth’s temperature, many poor nations will be the first to suffer increases in infectious disease, natural disasters and food shortages. Ironically, they are among the lowest producers of greenhouse gas emissions and the least able to adapt.

“The issue is disparity,” according to COEH expert Kirk Smith, professor of global environmental health at UC Berkeley. He highlights the uneven burden of climate change in a recent article titled, “Climate Change and Global Health: Quantifying a Growing Ethical Crisis,” published in the journal, *EcoHealth*. Smith says, “Rich countries have produced most of the greenhouse gases so far, and whatever damage we are experiencing or will experience over the next few decades is due to past emissions from you and me.”

U.S. per capita carbon dioxide emissions exceed 5 metric tons of carbon per year (tC/yr), while developing countries approximate 0.6 tC/yr, and more than 50 countries are below 0.2 tC/yr. As Smith’s article points out, the nations most vulnerable to global warming are the poorest. For instance, up to 80 per cent of malaria occurs in Africa, a continent with some of the lowest greenhouse gases emissions. As the Earth’s temperature warms, this vector-borne disease that kills up to two million a year will flourish in Africa’s increasingly hot, humid climate.¹

Smith uses the term, “natural debt index” as a quantitative measure of responsibility. He explains, “Current emissions are not strictly the problem. It is the cumulative amount in the atmosphere. More than

continued on page 4
I was shocked to hear on 7/3/08 that Dr. John Howard, the respected Director of the National Institute for Occupational Safety and Health (NIOSH), was not reappointed by Centers for Disease Control and Prevention (CDC) Director, Dr. Julie Gerberding. As a 7/11/08 editorial in the New York Times indicated, the denial of Dr. Howard’s reappointment led to “a pointless departure.” Dr. Howard enjoyed broad support for his efforts to bolster NIOSH during his 6-year tenure as director. In particular, Dr. Howard earned high praise from many in the New York and New Jersey congressional delegations for NIOSH’s efforts to provide health care to workers involved in the 9/11 World Trade Center (WTC) collapse rescue and clean-up. Letters of support were sent to Dr. Gerberding from many stakeholders, including members of Congress, the business community, labor groups, the American Industrial Hygiene Association, and the Education and Research Center Directors. The 7/9/08 issue of the Atlanta Constitution quoted Marc Freedman of the U.S. Chamber of Commerce as saying: “Frankly, we thought of this as a no-brainer.”

Speculation has been that Dr. Howard’s ouster is a result of administration unhappiness with his out-spoken support of expensive WTC health programs and/or friction with Dr. Gerberding. Whatever the reason, the loss of Dr. Howard’s leadership at NIOSH during the waning months of the Bush administration means that even less attention than usual will be paid to occupational health. The selection of Christine Branche, Ph.D., as the Acting Director only serves to underscore this point. Prior to joining NIOSH as Associate Director in 2007, she was a long-time employee of the CDC’s Center for Injury Prevention and Control; she does not have a background in occupational health. I am concerned that Dr. Gerberding will now be able to place NIOSH under the Coordinating Center for Environmental Health and Injury Prevention. She was prevented from doing so at the time of the CDC’s Futures Initiative by congressional criticism that such a reorganization would weaken federal efforts to ensure safety at the workplace. Whatever the result of the upcoming presidential election, new administrations usually take considerable time to process appointments such as the Director of NIOSH, so I foresee up to 18 months of lack of leadership for this important public health position.

I have respected Dr. Howard’s work for many years. I first met him in 1982 when we both were making presentations about our research on occupational lung disease as post-doctoral fellows in pulmonary medicine. I presented on chronic beryllium disease in an electronics recycling facility and John presented on fitness evaluations for respirator use. I was pleased to support his appointment by Governor Wilson to be head of Cal/OSHA where he did a fine job of leading that agency. I was even more pleased to support his appointment as Director of NIOSH because I knew he would provide pragmatic leadership that still maintained protections for workers. Our field desperately needed such leadership during the last 6 years. I know I speak for many when I say he will be missed. ☹️

Robert Spear Awarded UC Berkeley’s Highest Honor

P rofessor Robert Spear from the School of Public Health recently received UC Berkeley’s highest honor, the Berkeley Citation, for his “distinguished achievement and extraordinary service to the university.” He is one of only two scholars to receive the University’s award this year for those who significantly exceed the standards of excellence in their fields.

An engineer by training, Spear earned his bachelor’s and master’s degrees from UC Berkeley and his PhD in Control Engineering from Cambridge University. A post-doctoral fellowship in Environmental Health Sciences drew Spear back to UC Berkeley where he soon joined the faculty of the School of Public Health. Spear became a founding director of the Center for Occupational and Environmental Health and served as UC Berkeley’s Associate Dean, College of Engineering and Associate Dean, School of Public Health.

Spear’s research focuses on the assessment of human exposures to toxic and infectious agents in the environment. His early work investigated the exposure of agricultural workers to pesticides. Currently he collaborates with colleagues from UC Berkeley and the Sichuan Institute of Parasitic Disease in China to focus on the determinants of the incidence and control of the parasitic disease schistosomiasis, an illness infecting more than 200 million people outside the U.S.

Dean Stephen Shortell surprised Spear with the award bearing the University seal at the School of Public Health’s faculty recognition dinner on May 2, 2008. Shortell says, “We all offer our congratulations to Bob for his many contributions to our School and the campus. He is richly deserving of this special recognition.” ☹️

LETTER FROM THE DIRECTOR
Monetary estimates for occupational injuries, illnesses, and fatalities within the U.S. top $160 billion—nearly 80% of the cost estimates for cancer and roughly the same for diabetes, according to recent testimony by Paul Leigh to the House Appropriations Subcommittee on Labor, Health and Human Services, Education and Related Agencies. Research funding for the same health risks in 2006 showed striking disparities with the National Cancer Institute budget almost 20 times the NIOSH budget of $254 million.

Chairman David Obey invited Dr. Leigh, Professor of Health Economics at UC Davis’ School of Medicine, to explain to the Committee the costs associated with the government’s failure to address problems of occupational health and to recommend targets for policy changes and government spending.

Leigh’s estimates, expressed in 2005 dollars, were comparable to those of Liberty Mutual, one of the largest worker’s compensation insurers in the U.S. Theirs ranged from $155 billion to $232 billion in 1998. Both estimates represent direct costs such as spending on hospitals and physicians and indirect costs such as lost wages.

The amounts are staggering, yet Leigh believes the figures are under-estimated due to under-reporting of events. He told the Committee, “a number of studies indicate the Bureau of Labor Statistics may miss up to 70% of all non-fatal injuries and illnesses,” citing out-sourcing companies that hire contingent workers as a group less likely to report injuries.

The San Francisco Department of Public Health projects the closure will save over $700,000 annually with the outsourcing of services to private clinics. Patients, CCSF workers, and doctors and nurses protested the closure at a hearing of the Board of Supervisors in March, yet the clinic shut down on schedule.

Physician Sarah Jewell, associate chief of the Division of Occupational and Environmental Medicine, notes that the busy clinic logged more than 10,000 patient visits each year. Medical Director Stephen Born reported that, “We had what was probably the largest group of Board Certified Occupational Medicine specialists in this area taking care of CCSF workers. Ten part-time doctors received ‘pink slips,’ including specialists in injury surveillance and prevention.” The expertise of two case management nurses who streamlined care for injured employees was also lost as they were redeployed to new inpatient care jobs at SFGH.

The clinic’s role in injury prevention is another substantial loss not measured in direct monetary costs. “Clinic employees knew the right people to call if there was any problem,” says Born. “For instance, we noticed a rash of injuries two summers ago when school janitors were falling while stripping floors. We talked to the school district and they changed their work methods, significantly reducing injuries. Now that type of synergy may be lost.”

Born believes the clinic closure will cost the city more money than it will save. With medical care now offsite, indirect workers’ compensation costs will increase as injured hospital workers spend additional time away from their job. With the exception of needle-stick injuries, “workers who are injured here are frequently gone all day now,” reports Born. “In the past, they could just come over to our clinic, receive prompt care and go back to work.” Further, without case management support, Born expects the transition back to full duty may prove slower with valuable work time lost as a result. A final unfortunate consequence of the clinic closure is the loss of a valuable, “real world” training site for COEH trainees in the occupational medicine and nursing programs.
Climate Change (cont from page 1)

half of the CO\textsubscript{2} that was emitted 50 years ago by the U.S. economy has been removed by now through natural assimilative processes in the environment, mostly by absorption in the ocean. Much of the growth in future emissions will be in the current developing world; consequently, you can’t get a full grip on the problem by focusing on current emissions alone.”

Smith goes on to say, “A better measure of responsibility is the current amount of warming caused by our past actions.” Although Smith and other investigators had proposed this earlier, Brazilian negotiators were the first to officially propose this concept in the late nineties as the major means of distributing the responsibility for greenhouse gases. By this measure, the richest countries are imposing about 500 times more damage than they are receiving, and the poorest countries are receiving 16 times more damage than they impose—a measured inequity in terms of health risk.

In addition to inter-country inequity, intra-country inequity remains an environmental health equity issue. Smith’s article reminds us how the 2004 Hurricane Katrina disaster displayed levels of vulnerability within the U.S. Most of the impacts in New Orleans were among the poor or disadvantaged.

Smith points out, however, that the U.S. is no longer the most prolific country in terms of per capita emissions of total greenhouse gases. It is now Australia because along with CO\textsubscript{2}, Australia produces considerable methane, another even more powerful greenhouse gas. “It shifts the picture a bit—it doesn’t eliminate the inequity, but it does alter it.”

When you add methane to CO\textsubscript{2}, the ratio of natural debt is still significant: 40 to 1,” says Smith. This is because agriculture produces methane, and agriculture is something that exists even in poor countries. “The bottom line—one of the arguably biggest problems—is the great imbalance between those who cause the problem and those who are beginning to experience it.”

Smith worries about more than health impacts. He is concerned about changes in ecosystems, water supplies, coastlines, and so on. “We are a rich place by global comparison and fairly insulated from environmental risk factors, so it is a matter of perspective. I take not a risk perspective but rather a burden perspective. Maybe climate changes will double the death rate from diarrhea in Berkeley, California, to an extra death every two years. Compare that to a doubling of the death rate in Zimbabwe to 50,000 deaths a year. It is not just the increase in risk; it’s the increase in the background disease rate that counts—and how this affects the absolute number of lost life years.”

As we make changes to mitigate global warming, Smith proposes we pursue interventions in the energy sector that both reduce greenhouse gas emissions and other health-damaging pollution, resulting in what he calls “co-benefits.” For instance, a co-benefit of reducing green house gases is a reduction in air pollution, which is responsible for almost 2.5 million deaths a year.\textsuperscript{2} “If you can get a greenhouse benefit and a health benefit, it’s a win/win situation,” says Smith.

Sought internationally for his expertise on climate change, Smith stays abreast of leading-edge research for promoting a more sustainable future. He sees power generation technologies that were once science fiction coming into the mainstream for investment and assessment, such as wind power projects that generate electricity from kites or steam power created by drilling water into hot rock deep in the earth. Also once in the realm of science fiction are various geo-engineering concepts, such as parasols in space to block sunlight or sprinkling the oceans with iron filings to promote algae growth. These are now being carefully examined by sober scientific groups both for their negative side effects as well as effectiveness in reducing the effects of warming.

Smith views climate research as an expanding area for health scientists. He foresees hazards emerging from new materials and technology. “I am concerned about the health and occupational side-effects of the changes that lie ahead, but these are the kinds of issues our field has developed techniques to deal with,” says Smith. \textsuperscript{1,2}


**SMITH SHARES NOBEL PEACE PRIZE & WINS CHANCELLOR’S AWARD**

In November 2007, the United Nations’ Intergovernmental Panel on Climate Change (IPCC) and Albert Arnold Gore Jr. shared the Nobel Peace Prize for their efforts to research and disseminate greater knowledge about man-made climate change and to lay the foundations for the measures that are needed to counteract such change. The IPCC honored Kirk Smith as a Nobel Laureate because of his work as one of about 2000 contributing authors worldwide to the IPCC reports. He contributed to two of the three recent IPCC reports: “Impacts, Adaptation & Vulnerability, Contribution of Working Group II” and “Mitigation of Climate Change, Contribution of Working Group III,” of the Fourth Assessment published in 2007.

The directors and members of the COEH wish to recognize Smith’s dedication to advancing the world’s knowledge on climate change and to congratulate him on this exceptional award.

Smith also received the “Chancellor’s Award for Public Service” for research in the public interest in April 2008. Smith’s colleagues based their nomination on his single-minded and increasingly successful commitment of time and energy over a period of 25 years to addressing the burden of disease suffered by women and children exposed to contaminants arising from cooking and heating their homes in the developing world.

In 1987 he authored a book on the subject, “Biofuels, Air Pollution and Health: A Global Review" in which he pointed out that a significant fraction of the 14,000 child deaths every day from acute respiratory infections at that time were probably due to smoke exposure in their homes. This exposure and its impact is now well recognized, although hard scientific evidence is only beginning to solidify, substantial parts of it due to Professor Smith and his collaborators.

His contributions to the IPCC report, a series of important and compelling analyses in the refereed literature and in publications of the World Health Organization, all reveal his particular concern for the poor living in the developing world.
Pharmaceutical Ban Proves Seamless to Californians

California’s successful ban in 2002 of the pharmaceutical lindane showed that policymakers can greatly reduce a known threat to humans and the environment without negatively impacting public health. However, six years later, doctors in all other states continue to prescribe the pesticide to patients for the treatment of head lice and scabies, despite the availability of safer alternatives.

Mark Miller, M.D., MPH and director of UCSF’s Pediatric Environmental Health Specialty Unit (PEHSU) and assistant clinical professor of pediatrics, says, “Lindane is toxic to the neurological system. In fact, seizures have been reported even when lindane is used as directed. We are especially concerned that the fetus or young children may be more severely impacted because the brain development process can be disrupted as a result of exposure to these types of harmful chemicals.”

Not only is lindane bad for humans, it is also bad for the environment. Pharmaceuticals enter wastewater treatment systems through bathing, human excretion and the intentional disposal of medications down the toilet or sink. Many scientists are concerned about endocrine disrupting chemicals like lindane that impair development in wildlife during critical stages of growth.

Miller became involved in the issue about the time that the ban was going into effect in California. He was the academic representative on an intergovernmental task force, the Commission for Environmental Cooperation (CEC) — a side-agreement to the North American Free Trade Agreement. The CEC nominated lindane as a chemical for which they wanted to develop a plan to reduce or eliminate its use in Canada, Mexico and the U.S.

Miller saw an opportunity. He and his colleagues, including Sarah Janssen, Natural Resources Defense Council (NRDC) research scientist and COEH graduate, and Gina Solomon, NRDC senior research scientist, and co-director of COEH’s Occupational and Environmental Medicine residency program at UCSF, used a small amount of funding from PEHSU to survey a random sample of California pediatricians about the impact of the ban on clinical practice. They also evaluated calls to the California Poison Control System to measure unintentional exposures and examined data on annual average concentrations of lindane for several large wastewater treatment facilities. Detection of lindane in urban wastewater could be attributed to pharmaceutical use since there were no agricultural uses in those areas.

When applied to treat head lice, lindane is washed off after a few minutes and goes down the drain and into the city’s wastewater treatment facility. Wastewater treatment engineers of the Los Angeles County Sanitation District have calculated that the amount of lindane in one treatment for head lice is enough to bring 6 million gallons of water above the 19 part per trillion California water quality standard. Prior to the ban, mean wastewater concentrations of lindane frequently exceeded this level. The results of Miller’s study showed, that by 2006, lindane concentrations in wastewater dropped to essentially undetectable levels. Of the pediatricians who reported using lindane prior to the ban, 94 per cent changed their prescribing practices as a result of the ban. Calls to report unintentional exposure to lindane dropped from a high of 135 in 1998 to near zero in 2006.

Lindane is a persistent organic pollutant (nominated for inclusion in the Stockholm Persistent Organic Pollutants agreement), which travels long distances and accumulates in the food chain. “The production and use in one part of the world is actually a global problem,” stated Miller. “Yet we got rid of it in California, a state with 36 million people, and essentially nobody knew the difference.”

If clinicians in other parts of the U.S. followed the Food and Drug Administration (FDA) public health warning in 2003, they would not prescribe lindane for use on children weighing less than 110 pounds. However, the study showed that, although use is decreasing, there is a segment of the practicing clinician community that is resistant to change, particularly those in solo practice for more than 15 years.

Observes Miller, “The message I took from this study is that current FDA efforts don’t necessarily reach older and more isolated practitioners. It is only through policy limitations like the ban in California that you can ensure that people change their practices.”

“The Environmental Protection Agency has now banned all agricultural uses of lindane. The only remaining uses in the U.S., outside of California, are for head lice and scabies treatments,” says Janssen. “As we have seen so many times before, now other states are looking to California’s example and are considering their own pharmaceutical lindane bans.”

Future Leaders of Environmental Health

Five recent graduates from UC Berkeley’s School of Public Health are making a difference at the California Environmental Protection Agency’s Air Resources Board (ARB). Alumni Ryan Johnson, Susan Fischer, Karen Khamou, Kyra Naumoff Shields and Jamesine Rogers from Environmental Health Sciences (EHS) prove well trained for their challenging careers at ARB—offering the technical skills needed to solve today’s problems and the leadership to shape future debates in environmental health.

Jamesine Rogers, MPH ’05, tackled projects in her first year and a half at ARB that would excite any EHS student. Federal air quality policy, environmental justice issues at ports, and the Statewide Implementation Plan for 8-hour ozone represent some of the critical work shaping her days.

Rogers’ climate change studies at EHS appear time well spent. As part of a special assignment to the Emission Inventory Branch, Rogers was the lead author of ARB’s staff report on the 1990 statewide greenhouse gas (GHG) emissions level and 2020 emissions limit. Her work involved analyzing GHG emission trends and translating technical information into reports and workshops for a diverse audience of decision-makers.

Now part of ARB’s Land Use and Transportation team, Rogers works with stakeholders, state agencies, and UC researchers to develop strategies to reduce GHG emissions from passenger vehicle use. She also participates in an interagency team tasked with developing consensus recommendations from state agencies to ARB on how to reduce GHG emissions from land use and local governments. “As a public health trained employee, one of my roles is to ensure recommendations and strategies take public health and environmental justice into consideration,” reports Rogers.

Susan Fischer, PhD ’05, Air Resources Engineer, works in the Research Planning and Climate Outreach Section. Fischer coordinates the annual research plan with approximately 20 research concepts worth $6 million combined. She is the lead staff defining goals and managing contracts for an area of research new to ARB—Behavioral Change to support California’s climate policy. She will also play a role in ARB’s upcoming revision of its 10-year strategic plan for air pollution research.

In addition, Fischer takes research proposals to the Board and represents the Research Division on an agricultural outreach committee involving regulated stakeholders, air pollution control districts, academic researchers, and enforcement divisions. She also manages a project to catalog ongoing and recently completed climate research within California.

“The opportunity to plan and manage the many aspects of field research has prepared me well for a varied set of responsibilities,” says Fischer.

Ryan Johnson, MS ’06, started his career at ARB not long after graduation. He uses his background in chemistry, statistics and environmental health in his new role within the Indoor Exposure Assessment Section in the Research Division. As part of his responsibilities, Johnson manages external research projects funded by ARB, and works on in-house research conducted by the agency. In addition to these primary roles, his responsibilities include community outreach related to indoor air quality (IAQ), and collaborating with other agencies, such as the California Department of Public Health, to review guidelines and criteria for green buildings and environmentally preferable products.

The diversity of Johnson’s projects demonstrates the depth and breadth of his IAQ expertise. He will be leading the certification process for air-purifiers sold in California as a result of legislation signed by Governor Schwarzenegger in September 2006 that limits the concentration of ozone emitted from “air purifying” devices. Johnson’s current projects include managing a UC Berkeley contract that studies the effects of pollutants emitted from office equipment, and analyzing data on volatile organic compounds as part of a study on IAQ and ventilation in new homes.

According to Johnson, “My time in the EHS program at UC Berkeley not only helped me to develop the fundamental skills used by public health professionals, but it also exposed me to some of the incredible efforts being put forth to improve public health both in California and abroad. Although most of my academic work focused on public health issues faced in the developing world, I find that I have been able to readily apply those skills that I gained to work being done within the state of California.”

Karen Khamou, MS ’04, Air Pollution Specialist, began her work at ARB in 2005, focusing on the State Implementation Plan to reduce ozone. She worked with technical and transportation planning staff from local air districts in San Diego and Ventura in developing their plans to reduce ozone. Ms. Khamou also developed measures for emission reductions from ships and trains related to the movement of goods throughout the State.
Currently, Khamou coordinates ARB divisions and other State agencies working on GHG reduction measures and market policies for “Transportation and Goods Movement” under the Global Warming Solutions Act of 2006 (AB 32). This group evaluates strategies to include in ARB’s Scoping Plan. The Scoping Plan provides a framework for the overall implementation of AB 32. It describes how California will cost-effectively reduce GHG emissions back to 1990 levels by 2020.

In addition, Ms. Khamou coordinated technical presentations from all State agencies for the sector-based public workshop on the Scoping Plan. This event solicited public comment and provided an overview of the control technologies and strategies to reduce GHG from all sectors. She also leads the development and analysis of the “Voluntary Emission Reductions” at the Office of Climate Change under AB 32.

“My integrated education at the School of Public Health gave me the skills to analyze the connections between health needs, technological needs and availability, and environmental and economic impacts. It also taught me work with people across different fields,” says Khamou.

Kyra Naumoff Shields, PhD ’07, began her tenure at ARB as an Air Pollution Specialist in October 2007. Like Fischer, she works in the Research Planning and Climate Change Outreach Section. She develops voluntary guidance and protocols for small California businesses to reduce their GHG emissions. This strategy is one of the State’s early action measures and will likely go before the Board in April 2009.

She believes the EHS emphasis on pragmatic research was an asset that helped her career. “My time in the program gave me the skills necessary to interpret scientific data to recommend appropriate action.” While in EHS, her area of specialization was indoor air pollution generated from simple biomass-burning cookstoves typically found in developing countries. In addition to causing indoor air pollution, such cookstoves generate emissions that contribute to global warming. “Given my interest in expanding my research expertise beyond indoor air pollution and California’s leadership on global warming, it was a natural bridge to join the research division at ARB to work in one of the new sections created after the passage of AB 32.”

Congratulations to Soo-Jeong Lee who won a two-year fellowship from the Center for Disease Control and Prevention’s (CDC) Epidemic Intelligence Service to attend its postgraduate program for health professionals. EIS is one of the country’s critical epidemiology training services with research designed to combat the root causes of major epidemics.

In 2007, Soo-Jeong Lee received her PhD from the University of California, San Francisco, as well as completing Adult Nurse Practitioner training. While a doctoral candidate, Lee received 16 scholarships and awards including the American Association of Occupational Health Nurses (AAOHN) Medique New Investigator Award for her dissertation. Since graduating, Lee has worked as a research scientist for the Occupational Health Branch of the California Department of Public Health, helping them define the extent of work-related injury and illness in California.

Lee’s dissertation explored a major occupational health problem among nurses—work related musculoskeletal disorders. Over 400 members of the American Association of Critical Care Nurses participated in her study. She investigated factors affecting nurses’ perceptions of risk of musculoskeletal injury and safe patient handling behaviors. Lee found that risk perception of musculoskeletal injury was associated with job strain, physical workload, frequency of patient handling, experience of musculoskeletal symptoms and a lack of lifting devices or lifting teams.

On the other hand, safe patient handling behavior was associated with work shift, social support, commitment to the job, a better safety climate reflecting an organizational safety culture, and an imbalance between effort and reward at work. Of note, risk perception was not a significant predictor for safe work behavior. These findings highlight the important influence that work factors, such as organizational and psychosocial characteristics, may have on safe work performance.

In her application to the EIS, Lee shared her goal of becoming a leading researcher in the field of occupational health. “As for my post-doctoral training, being part of the EIS program is something I have dreamed about.” With her recent success, Lee took an important step toward achieving her goal.

Nursing Students Receive Research Awards from the AAOHN Foundation

Doctoral students from the UCSF School of Nursing’s Occupational and Environmental Health Nursing (OEHN) program have had considerable success in recent years in obtaining research funding from the AAOHN Foundation, the charitable arm of AAOHN, the primary association providing leadership to practicing OEHNs. The Foundation is committed to funding substantive work aimed at solving workplace health and safety problems. In addition to Lee’s Medique award, Pamela Foreman received this same new investigator award in 2005. Three other students—Barbara Burgel (2008), Kathleen Mullen (2006), and Lynette Landry (2001)—were honored with the Association’s most prestigious research award, the AAOHN Foundation Research Grant.
Diabetes Linked to Air Pollution

An international team of researchers is the first to link traffic-related ambient air pollution exposure to an increased prevalence of diabetes. This study by Professor Michael Jerrett from the University of California, Berkeley, and colleagues presents a potentially new intervention pathway to stem the growth of a global health pandemic.

The International Diabetes Federation estimates 246 million people worldwide have the disease, and by 2025, this estimate will reach 380 million. Traditional lifestyle interventions, such as diet modification and exercise, have only been moderately successful in disease prevention.

Acute exposure to air pollution is widely thought to trigger cardio-respiratory events such as asthma and heart attacks, and growing evidence suggests diabetics may be more susceptible. Half of all deaths among diabetics are associated with cardiovascular illness. Despite the findings on acute effects, “No one has looked at long-term exposures to air pollution and its contribution to diabetes, although a few conceptual articles suggest an association might exist,” says Jerrett.

Oxidative stress and proinflammatory mediators at the cellular and signal transduction level trigger insulin resistance, the biological pathway that causes Type 2 diabetes. Jerrett noted, “Rob Brook, a cardiologist from the University of Michigan, originally hypothesized many of the same mechanisms that link air pollution to cardiovascular health making its association with diabetes plausible. Because of our ongoing study with air pollution, we were able to link large databases from a government operated universal health insurance program to environmental exposures and medical conditions to test Dr. Brook’s hypothesis.”

The study was part of a 10-year project measuring the health effects of air pollution funded by the Canadian Institutes of Health Research and Health Canada. The cohort included 7,500 subjects over age 40 using two academic respiratory disease clinics in Hamilton and Toronto, Ontario, from 1992 to 2002.

Field measurements of nitrogen dioxide (NO₂) were taken from more than 250 locations between 2002 and 2004. Measurements were cross-validated against data from 1997. The current and historical data were highly correlated, meaning the short-term measurements fit the long-term spatial exposure pattern.

Using the participants’ unique Health Insurance Number (HIN), the team searched patient billing and hospital discharge databases for the diagnosis of diabetes. Researchers used HIN postal codes to assign air pollution estimates to each participant.

After adjusting for age, body mass index and neighborhood income, the results showed a positive correlation between NO₂ exposure and diabetes in women, but not in men. Women in the highest 25% of exposure to NO₂ were 17% more likely to have diabetes than women in the lowest 25% of the exposure range.

“Air pollution is an involuntary exposure modifiable by regulatory changes,” noted Jerrett. “Because the entire population experiences the exposure, even small risks can translate into large burdens of illness.”

In the future, Jerrett wants to study new onset of diabetes in relation to air pollution. “These studies are costly,” he says, “so we need prevalence studies such as this one to first show there is an effect. We hope these findings generate more interest from funding agencies and other researchers on this important topic.”

A Message for Farmworkers—Heat Kills

Lack of adequate drinking water, rest breaks and shade are the harsh realities that induce heat illness among low-wage immigrant workers, resulting in missed workdays or even death according to participants in a pilot project to protect against heat stress.

Suzanne Teran, coordinator of public programs for COEH’s Labor Occupational Health Program, designed and implemented the community-based initiative, “Protecting California’s Farm Workers from Heat-Related Illness: Piloting Health and Safety Communication Strategies For Hard-to-Reach Farmworkers.”

Motivated by a new Cal/OSHA standard that requires employers in agriculture to take many steps to prevent heat illness, including providing sufficient quantities of drinking water to employees, (Title 8 CCR 3457), Teran saw an opportunity to test a community-based model to communicate the dangers of heat stress to an employment sector that remains tough to reach through traditional worksite training and education.

With $75,000 in funding, Teran chose Mendota, CA, as her project site where half of the mostly Latino population of over 7,500 work in agriculture. Next, Teran partnered with Proteus, a local non-profit trusted by the community that specializes in employment, training, education and community service.

Choosing a social marketing approach for her project, Teran “originally planned to conduct needs-assessment interviews with people who head community organizations that work with farmworkers, using them as spokespeople for the broader community.” After her initial interviews, she chose instead to talk directly to her target audience—farmworkers—to find a theme that would grab their attention.

From focus groups, Teran learned that “to get any notice, farmworkers had to realize the severe consequences.” Initial campaign themes such as, “It’s your right, there’s a new law,” or “Watch out for one another, use a buddy,” proved problematic. Said one participant, “If you seem to have a buddy on the crew you’ll be split up by your crew leader.” People also reacted with cynicism to the theme of worker rights. In the end, farmworkers picked the most poignant message: “El Calor Puede Matar,” or “Heat Kills.”

Focus group dialogue quickly revealed the need for worker and community education. For instance, farmworkers said they avoid drinking lots of water to avoid frequent trips to the bathroom. They feared falling behind their crew, unaware that water would also help them sweat and cool off. Sucking lemons or lemons in water was a method frequently reported as a way to manage thirst. Teran says lemons may moisten the mouth, but fail to satisfy hydration. “You need to address these beliefs if you are going to address heat stress,” says Teran.

The campaign kicked off with the support of the mayor and the City of Mendota. Teran highlights three elements of the campaign that were essential to its success. First, she points out the value of having a trusted community organization as a collaborator when time and money are limited. “Proteus opened channels to the community and helped build support for the campaign.”

Second, the focus groups revealed hidden gems of information that helped their communication strategy. For example, drivers who bring farmworkers to the fields volunteered to hang posters inside their vans and use their newsletters to spread the word.

Finally, Teran brought her intervention campaign to places where farmworkers naturally gather. For example, she worked with Proteus to organize fun community events at the bank on payday to reach hundreds of farmworkers at once.

Teran’s team also provided a training guide for employers; however, the project truly focused on direct communication to farmworkers as opposed to using a top-down approach. With more resources, Teran sees this initiative unfolding on a bigger scale. “I’m sure there are many Mendota’s scattered throughout the valley,” which would benefit from heat stress interventions within the farmworker community.
Highlight on Student Research: COEH students work in the lab and in the field

Students Investigate BART Noise

After moving to the Bay Area, Alberto Ortega quickly realized that a rapid transit train ride had its costs. “It was so loud I covered my ears half of the time,” he said.

Deciding to investigate, Ortega, a first year Environmental Health Sciences PhD candidate at UC Berkeley, and fellow student Ray Minjares earned a COEH Student Award in 2006 to assess Bay Area Rapid Transit (BART) noise affecting riders and the community.

Underground track sections tend to be the loudest for riders— for example, peak measurements for the route between Downtown Berkeley and Ashby at times exceeded 95 decibels (dB)—a noise comparable to standing under a large jet taking off. Minjares says the noise is enough to cause hearing loss if sustained, but damage is unlikely for daily riders. Community noise reached up to 90dB measured 50 feet from the tracks.

The screeching noise we hear comes from friction between the train wheel and the track. “The more the track wears, the more uneven it becomes, and therefore the louder the noise,” notes Ortega. Rail grinding and smoothing is probably the most practical way to reduce train noise, according to Minjares. BART uses grinder machines to smooth track surfaces, but they can only employ them at night when the BART trains are not running.

“Reducing train speed would significantly reduce noise pollution. Yet this solution is undesirable because no one wants to slow their arrival time,” reports Ortega.

The rail platform also influences noise levels. BART rail platforms are made of either concrete or ballast. Concrete platforms reflect noise while the latter sit above sound-absorbing gravel and soil. “In urban areas where the train has to be above ground, the concrete surfaces contribute to the noise. Around stations with less density, such as Fremont and Dublin, the track can sit on the ground,” said Ortega.

The investigators used on-board noise measurements to develop models for assessing community train noise. The sound absorption of construction materials used in BART cars affected on-board noise measures. Floor thickness, carpets and door seals were some of the variables Ortega and Minjares factored into the model.

The initial study involved the simultaneous collection of on-board noise levels and train locations determined by a global positioning system. Noise emissions and location data were coupled with noise absorption and dispersion factors associated with track elevation, platform design and track bed construction materials. This allowed an estimate of noise emissions from the train-track complex at various segments along the line.

Researchers could use the data in a three dimensional community noise dispersion model to predict train rail noise exposures at a local level. BART controls train speed, an important determinant of noise emissions, to maintain system wide efficiency. When the system functions without delays, train speeds are predictable and can be included as model inputs. “With this preliminary study,” concludes Minjares and Ortega, “we learned the variables necessary to proceed with future research.”

Keep Your Hands Down—If You Can

During cold and flu season, hand to face germ transfer may increase our risk of getting sick. Now a new study by Mark Nicas from UC Berkeley’s School of Public Health, and Daniel Best, an MS candidate studying Environmental Health Sciences at Berkeley, proves that face touching is a habit that is hard to break.

Best videotaped ten subjects who performed office-type work for three hours to measure the number of times their hands touched their eyes, nostrils, and lips. Results showed participants contacted their face on average 16 times per hour. Over three hours of observation, some touched their face up to 104 times.

Best noticed “a bit of consciousness” at the beginning of the sessions, but his impression was the subjects soon forgot about the camera. Often people rested their head in their hands or rubbed their eyes when they were tired. “They knew we were observing hand-face contacts,” says Best, “yet it is so ingrained, people do it anyway.” Further, he found if subjects tended to touch one facial orifice frequently, such as their lips, they were more likely to make repeated contact with their eyes and nostrils as well.

Nicas and Best created an exposure model that incorporated the hand contact rate and other factors that should influence the number of pathogens transferred to target facial membranes. Their research paper, “A Study Quantifying the Hand-to-Face Contact Rate and Its Potential Application to Predicting Respiratory Tract Infection,” appeared in the March issue of Applied Occupational and Environmental Hygiene. Best received a National Occupational Research Agenda award from the Berkeley campus of COEH to conduct his study.

Science through the Eyes of a Young Generation

For every dozen undergraduates who apply for an apprenticeship in the Children’s Environmental Health Laboratory at UC Berkeley, only few will be chosen. Yet for these high-achieving students, the rewards are exceptional. Their experience in the lab will help them understand human biology and the environmental factors that contribute to disease formation. Like their predecessors, many will go on to medical school or obtain their master’s and PhD degrees in Public Health.
Laboratory investigations focus on biomarker studies in children's environmental health. The interdisciplinary nature of the students’ research exemplifies the lab's collaborative approach. “We use a team structure,” says Professor Nina Holland, director of the lab. “When students first come to work here, they work with graduate students and postdoctoral researchers on different projects until they are ready for independent projects.”

Holland marvels at the academic quality of her apprentices. This year three new undergraduate students—Bobby Dhesi, Pin Xiang and Aurelia Cheng—are recipients of the Regents' and Chancellor's Scholarship, the most prestigious at UC Berkeley. Three other students who have been working in the lab for two to three years are completing their honors projects: Raymond Lai and Seung Pak from the Department of Molecular and Cell Biology, and An Nguyen from the Department of Integrative Biology.

Seung Pak's honors project is focused on the effects of age, season and environmental factors on cytokines of Latino children and mothers from agricultural community of Salinas Valley. Cytokines are involved in immune response, and can help predict development of asthma and other diseases. Seung plans to study for an additional semester to earn a double major in economics as a complement to his honors degree in molecular and cell biology.

Raymond Lai studied the genetic risk factors and enzyme activities in pediatric inflammatory bowel disease patients for his honors project. “Mentoring and lab skills,” said Lai, were the aspects of his internship that he valued most. He plans to take his experience from “bench to bedside” with dreams of medical school ahead.

According to Holland, some students stay on as staff researchers after they graduate and some go on to become the lab’s coordinator, as did Paul Yousefi and Nishat Shaikh. Shaikh worked as the lab’s coordinator for two years after graduating before deciding to pursue her MPH and PhD at UC Berkeley. She attributes Holland’s encouragement as key to her switch from administration to academia. Her research skills were rewarded with a first prize this April in the School of Public Health’s student poster presentations.

Holland credits PhD candidate Karen Huen for using her four years of experience in the lab to mentor undergraduates. Since her days as a master’s student, Huen has successfully published in highly ranked journals. Her study of susceptibility to agricultural pesticide exposures among pregnant Latina woman and children, published in the journal Environmental Health Perspectives, showed that some of the people in her study population, especially children, may be vulnerable to organophosphate pesticides toxicity because of their genotype and levels of enzymes such as paraoxonase involved in pesticide metabolism.

Regents’ and Chancellor’s Scholar Aurelia Cheng says her initiation into the lab was analogous to learning a new language. “At first when placed in a foreign country, you feel lost and out of place. You feel embarrassed asking a question every few minutes, not quite grasping the language yet. That was my experience when first joining the lab.” Soon she became familiar with the system and acronyms used by colleagues and began to feel at home in that once strange environment.

“The things I have learned here can only come from hands-on experience, not in a classroom. And I know that it will prepare me for whatever career path I choose to take, whether it is research, medicine or something else all together,” Cheng said. She speaks for her fellow students, “I am very grateful to all those who have taken the time to train me; they have greatly enhanced my future opportunities for success in almost any field.”

Of note, Bobby Dhesi and Seung Pak were accepted into COEH’s summer internship program focused on the human health effects of environmental exposures. They started their 8-week internship in June 2008 along with six other applicants. This program, entitled Short-Term Educational Experiences for Research in the Environmental Sciences (STEER), is funded by the National Institute for Environmental Health Sciences (STEER), is funded by the National Institute for Environmental Health Sciences. It is designed to introduce undergraduate and high school students to the field. For more information, please see the March 2008 issue of Bridges on the COEH web site: http://coeh.berkeley.edu.
The Northern California Center for Occupational and Environmental Health (COEH), a multidisciplinary program of the University of California at Berkeley, Davis, and San Francisco, promotes health and safety in workplaces and communities by:

- Educating health professionals in epidemiology, ergonomics, industrial hygiene, medicine, nursing, toxicology, and related fields to be leaders in occupational and environmental health.
- Developing new knowledge through an interdisciplinary research agenda focused on preventing illness and injury.
- Responding to the needs of people affected by hazards in their workplaces or communities, with special attention to vulnerable populations.

Through these activities COEH supports federal, state, and local agencies, health and safety professionals, industry, labor, and community-based organizations in their efforts to prevent occupational and environmental disease and injury.

COEH is an Education and Research Center (ERC) of the National Institute for Occupational Safety and Health (NIOSH).