



Bridges

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STUDY LINKS “DUSTY TRADES” TO WORK DISABILITY AND COPD

An international study of nearly 7,500 participants is the first prospective, population-based research to show that workplace exposure to dust, gas and fumes plays a key role in work disability due to respiratory causes.

Paul D. Blanc, medical professor and chief of the Division of Occupational and Environmental Medicine at UCSF, was senior author of the analysis that was led by **Kjell Torén**, a Swedish researcher. The study appeared in the April 2009 issue of the respiratory journal, *Thorax*.

Researchers used questionnaires administered at baseline and then in a follow-up study to classify subjects who had left their jobs over time because of breathing problems. All jobs were coded using a job exposure matrix (JEM), and then ranked for exposure to biological or mineral dust, gases and fumes.

During the 8-year follow-up study period, 1% of participants reported they changed their job due to respiratory problems. Among those with asthma, researchers found the rate of job change may be as high as 5%. Blanc and colleagues calculate

that, at a population level, 5% of all workers and 25% of asthmatics will experience job change due to respiratory disability during their careers. Female asthmatics were at greater risk of disability compared to women in the control group without asthma.¹

Also importantly, the study found that those with jobs most likely to involve exposure to dust or fumes were three times more likely to report respiratory work disability. This was true for those without asthma as well as those with asthma. The researchers designed their study to account for potentially confounding factors such as smoking history and exposure to secondhand smoke in the workplace. Blanc and his co-authors concluded that dusty trades contribute globally to the risk of workplace disability and that fewer workers would change their job if work conditions improved.

Blanc has shown that not only are dusty trades associated with workplace disability among those with asthma, but also that such exposures play a role in chronic obstructive pulmonary disease (COPD) risk.

According to the Centers for Disease Control and Prevention, a recent national health survey suggests COPD affects approximately 24 million Americans. It is a leading cause of death, illness and disability.² COPD can result from chronic bronchitis or emphysema. Those affected have trouble breathing, which worsens over time.

Smoking is the main culprit in about 80% of all cases. But COEH director and study collaborator **John Balmes** and Blanc reported in a systematic review of the literature, adopted in 2002 as an official statement by the American Thoracic Society, that occupational exposures may account for 15% of the global burden of COPD.³ A follow-up literature analysis by Blanc and his Swedish collaborator Torén reinforced and amplified these findings.⁴

In a separate study published in the July 2009 issue of *Occupational and Environmental Medicine*, Blanc's findings suggest the combined effect of smoking and occupational exposure have an additive effect. “The combination was worse, but the effects don't multiply on each other,”

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Howard Returns, Michaels is Appointed



John R. Balmes

In a previous letter from fall 2008, I lamented the dismissal of **John Howard** from director of NIOSH as a failure of Julie Gerberding, then director of the CDC, to appreciate the importance of the agency to the health and safety of the nation's workforce. Despite the fact that Dr. Howard received support from all sectors involved in occupational safety and health, from labor, industry, professional organizations, and academic researchers, he was ousted over what seemed to be political concerns unrelated to the quality of his performance. He stood up for the independence of NIOSH when Dr. Gerberding attempted to reorganize the agency into one of four CDC coordinating centers. He also stood up for the emergency responders to the World Trade Center disaster when others in the Bush administration wanted to reduce efforts to address their health concerns. It is no surprise, therefore, that the recent news of Dr. Howard's reappointment as director of NIOSH was almost universally greeted with praise. Not only does his reappointment represent a personal vindication, but an appropriate response to the efforts of the previous administration to put politics ahead of science and public health.

Another Obama appointee who engendered considerable controversy recently was **David Michaels**, currently research professor and interim chair of the Department of Environmental and Occupational Health at the George Washington University (GWU) School of Public Health and Health Services. Dr. Michaels has just been appointed the new Assistant Secretary of Labor for OSHA. He is an epidemiologist with extensive experience in research, regulatory and public policy, and program administration. He served as the Assistant Secretary for Environment, Safety and Health of the Department of Energy (DOE) from 1998 through January 2001. In this position, he had primary responsibility for protecting the health and safety of workers, the neighboring communities and the environment surrounding the nation's nuclear weapons facilities. He was the chief architect of the initiative to compensate workers in the nation's large-scale nuclear weapons industry who developed cancer or lung disease as a result of exposure to radiation, beryllium and other hazards. This initiative, the Energy Employees Occupational Injury Compensation Act, became law in 2000.

So why was Dr. Michaels' nomination so controversial? Since leaving the DOE, he has been directing the project on Scientific Knowledge and Public Policy at GWU, which brings together an interdisciplinary group of scientists to examine the use and misuse of science in two forums in which public policy is shaped, the courts and the regulatory arena. He is the author of *Doubt is Their Product: How Industry's Assault on Science Threatens Your Health* and was guest editor of a special issue on *Scientific Evidence and Public Policy* in the *American Journal of Public Health* and of an issue of *Law and Contemporary Problems* entitled *Sequestered Science: The Consequences of Undisclosed Knowledge*. The thrust of this work has been to bring to light the efforts of various corporate interests to use pseudo-

science to undermine efforts to develop regulations to protect health and/or the environment (e.g., the Tobacco Papers at the UCSF Library or Exxon's support of climate change denial).

Certain conservative media outlets, including Fox News and the Washington Times, attacked David Michaels as a promoter of "junk science" because a chapter of his book is devoted to a critique of a 1993 Supreme Court ruling, *Daubert v. Merrell Dow Pharmaceuticals Inc.*, which set the standard for admitting expert testimony in federal courts. They also trumpeted his views on gun control, apparently concerned that he will promote restrictions on the storage or possession of guns in workplaces. Because Obama's appointee for "green jobs, energy and innovation," Van Jones, was hounded out of his position by such media attacks, these tactics were used against Michaels. One conservative commentator, Ken Blackwell on the RedState.com blog wrote, "Compared to Michaels, Mr. Van Jones is Mr. Dick Van Dyke."

I have known David for many years and served with him on the NIOSH Safety and Occupational Health Study Section. To me, it is exciting that such a respected scientist and experienced public servant who has championed scientific integrity has been appointed a leader in the Obama administration. In 2006, David received the Scientific Freedom and Responsibility Award from the American Association for the Advancement of Science for both his work on behalf of nuclear weapons workers and his advocacy for scientific integrity. In my opinion, President Obama has made an outstanding choice for the new head of OSHA.

Kirk Smith Receives Heinz Award for Outstanding Global Environmental Achievements

COEH faculty member **Kirk Smith** was honored with a Heinz Award for his research exposing the global dangers to human health from indoor fuel use. Smith was the first to recognize and quantify the magnitude of the pollution exposure to the poorest persons in developing countries resulting from cooking indoors with solid fuels such as wood, coal and cow dung.

Created to honor U.S. Senator John Heinz, the 2009 Heinz Awards commemorate the late senator's long-standing commitment to the environment by bestowing \$100,000 awards to 10 individuals whose achievements have helped bring about a cleaner, greener and more sustainable planet.

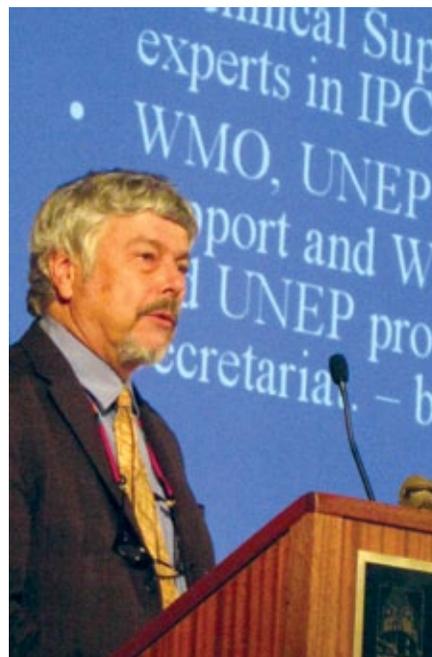
With estimates that 50% of the world's population use solid fuels for cooking and heat, the health impacts of this exposure are believed to be larger than any other environmental risk with the exception of contaminated water supplies. He was also the first to point out the important global climate implications of cookstove emissions. According to the World Health Organization, toxic emissions from cooking stoves are

responsible for causing 1.6 million premature deaths a year.

Smith, a professor of global environmental health at UC Berkeley, and his colleagues and students conducted the first randomized trial of air pollution in highland Guatemala to demonstrate how improved stoves can reduce child pneumonia, the chief cause of death among children worldwide.

In the 1990s, he also conducted the first measurements of the global warming impacts of stoves with colleagues in India and China. International organizations and climate scientists still rely on these measurements for their climate models.

Teresa Heinz, chairman of the Foundation said, "Many human health problems are linked to environmental factors. Dr. Smith's work brings to bear exposure assessment, epidemiological methods and field trials in the context of one of the largest environmental issues in the world—indoor air pollution. Dr. Smith's work has helped to provide a clearer understanding of this invisible threat, an understanding that is leading to solutions around the globe." 🌍



Kirk Smith

Allan Smith Wins John Goldsmith Award

COEH member **Allan Smith** won the John Goldsmith Award from the International Society for Environmental Epidemiology (ISEE) for his outstanding lifetime achievements in environmental epidemiology. Smith's work has contributed to many new findings concerning the health effects of arsenic in drinking water and has led to reductions in arsenic drinking water standards.

Smith is a professor of epidemiology in the School of Public Health at UC Berkeley and director of the Arsenic Health Effects Research Program.

Smith accepted the award at the ISEE conference in Dublin, Ireland, in August 2009 and delivered a plenary address entitled, "Epidemiology is Wonderful." Smith continues to work on major research projects in South Asia and South America.

The directors, faculty and students of COEH wish to congratulate Smith on his outstanding achievement. 🌍



Allan Smith

COEH Investigator Conducts Multidisciplinary Research on Chemical Exposures

COEH faculty member **Steve Rappaport** has long been interested in exposures to toxic chemicals in the workplace and the general environment. These interests have taken him into a wide array of investigations involving a score of collaborations. For example, Rappaport is director of UC Berkeley's Center for Exposure Biology, which brings together Berkeley faculty from several colleges and schools to develop technologies that may revolutionize the way scientists conduct epidemiologic studies.

Funded by a four-year \$4.7 million grant from the National Institute of Environmental Health Sciences, the Center uses advanced analytical chemistry and genetic techniques to measure altered proteins (called protein adducts) and mutated cells in human blood as biomarkers of past exposures and toxic effects. Rappaport says they are now in the "proof of concept" phase on three linked projects: to identify carcinogens associated with lymphoma, to find mutations of single cells associated with leukemia and lymphoma, and to develop a portable biosensor for measuring protein adducts in human blood. Once the projects are complete, "we'll be able to take a fraction of a drop of blood, process it using a lab on a chip, and then detect protein adducts, which represent biomarkers of exposures to carcinogenic

ing with **Evan Williams**, professor of Chemistry at UC Berkeley, Rappaport's laboratory conducted experiments to detect a constellation of protein adducts in human blood. Then, they selected one prototype adduct to prove the concept that samples can be processed with lab-on-a-chip devices and then detected with a biosensor. To do this, they first developed an immunoassay (a biochemical test), which makes it possible to detect targeted adducts with the test system. "Now that we have the immunoassay, our next step is to apply it to the lab-on-a-chip platform in **Richard Mathies'** laboratory," said Rappaport. Mathies is dean of the College of Chemistry at UC Berkeley and heads the second project in the Center for Exposure Biology, in collaboration with **Martyn Smith** and **Luoping Zhang** of COEH. Rappaport calls Mathies a pioneer in the technology that integrates multiple lab functions onto a single computer chip. By combining the lab-on-a-chip device, which will process blood samples, with a sensitive biosensor developed by **Bernhard Boser**, professor of Electrical Engineering at UC Berkeley and leader of the third project of the Center, the team expects to detect targeted protein adducts in a single drop of blood.

If successful, the technology will allow hundreds or even thousands of blood

begin measuring protein adducts and mutated cells in archived blood obtained from working populations as well as cancer cases and control subjects.

The Center for Exposure Biology is also pursuing funding on an additional project with principal investigator **Patricia Buffler**, professor of epidemiology at UC Berkeley, which will test for protein adducts in archived, neonatal dried blood spots from childhood leukemia cases and matched controls in Northern California. "It's an example of how we plan to use our new technology for investigating levels of environmental exposures in epidemiologic studies," said Rappaport.

In other research, Rappaport published the first evidence that two enzyme pathways may be responsible for human benzene metabolism instead of one, as scientists previously thought.¹ The study appeared in the June 2009 issue of *Environmental Health Perspectives*. Benzene is an aromatic chemical that is widely used in industry and is also present in tobacco smoke, gasoline and engine exhausts. "We've known for nearly a hundred years that metabolism of benzene leads to bone marrow toxicity and can cause leukemia in humans," said Rappaport. "Yet, prior to our studies, human benzene metabolism had not been well characterized at different levels of exposure." This work was conducted in collaboration with COEH members Martyn Smith and Luoping Zhang and with investigators from the National Cancer Institute and the Chinese Center for Disease Control and Prevention. By measuring benzene metabolites in blood and urine from Chinese workers in both benzene-containing workplaces and control workplaces, the team was able to determine that control workers and low-exposed workers metabolized benzene much more efficiently than workers exposed at higher levels. This finding led Rappaport to use the data to test whether there might be a second metabolizing enzyme that efficiently metabolized benzene at low levels of

If successful, the technology will allow hundreds or even thousands of blood samples to be assayed for protein adducts and mutated cells rapidly and at low cost

substances, and mutated cells which represent biomarkers of early toxic effect," said Rappaport.

Rappaport heads the first project of the Center for Exposure Biology, which is using protein adducts to identify possible carcinogens in human blood. Work-

samples to be assayed for protein adducts and mutated cells rapidly and at low cost. Rappaport expects to have a working prototype in two years. The research team, which includes six graduate students and four post-doctoral researchers in five laboratories, will then

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Study of Auto Mechanics Examines Health Effects of Solvent Exposure

Almost a decade ago, COEH faculty member **Robert Harrison** diagnosed an auto repair technician with peripheral neuropathy at the UCSF Occupational and Environmental Medicine clinic. Symptoms of peripheral neuropathy include numbness, tremors and loss of balance. The technician was exposed to an aerosol brake cleaner containing hexane, a known neurotoxin.¹ The discovery triggered a dissertation study at UC Berkeley by then industrial hygiene student, **Michael Wilson**, now a COEH research scientist, that has recently expanded into a major project with global implications for workers' health.

The project, led by **Katharine Hammond**, chair of Environmental Health Sciences at UC Berkeley, is funded by a five year, \$2.5 million award from the National Institute of Environmental Health Sciences. It will examine the neurological and reproductive effects of hexane on auto workers. The multi-disciplinary, multi-campus effort includes co-investigators at UC Berkeley, UC Davis, Stanford University Medical Center, the Parkinson's Institute and the California Department of Public Health. The award will also fund student researchers.

Investigators renewed contact with the International Association of Machinists and Aerospace Workers union and developed protocols in year one. Data collection began in October 2009 with physical exams, including collection of biologic samples, and 2-hour interviews with each participant. The goal will be to enroll 1,200 auto technicians over the next two years.

Building on findings published in the *Journal of Occupational and Environmental Hygiene*² by Drs. Wilson and Hammond, the team will conduct complex exposure assessments to explain how workplace exposures vary and identify what combinations of volatile organic compounds, such as hexane, acetone and toluene, are most toxic.



Workers in the automotive industry risk exposure to toxins through aerosol sprays on a regular basis. Photo courtesy of Michael Wilson

"We are looking at persistent effects and how other solvents interplay," said Hammond. In addition to peripheral neuropathy, the researchers will analyze their data for signs of neuropsychological, vision and reproductive problems. "We saw some evidence in the initial study of blue yellow color blindness, which is an acquired defect."

"We need to better understand health effects of solvent exposures that are below limits regulated by standards," adds Hammond, "because even low concentrations may prove unsafe." Hexane is also a component of gasoline, so Hammond's research may produce findings of significance to populations worldwide. 🧐

¹ Harrison, R, Israel, L, Larabee, P, Cone, J, Brewer, M, Das, R, Brumis, S, Bowler, R, Wilson, MP, Hammond, SK, McCammon, J, Teass, A, Ramsey, D. n-Hexane Related Peripheral Neuropathy among Automotive Mechanics – California. *Morbidity and Mortality Weekly Report*. 2001 November 16; 50(45):1011-3.

² Wilson MP, Hammond SK, Nicas M, Hubbard AE. Worker Exposure to Volatile Organic Compounds in the Vehicle Repair Industry. *J Occup Environ Hyg*. 2007 May; (5):301-10.

Randomized Controlled Trials a Strength of Ergonomics Research

Randomized controlled trials (RCT) have emerged in the last decade as the highest standard for determining the effectiveness of health interventions. COEH faculty member **David Rempel** and his ergonomics team have completed six occupational health RCTs in 10 years—a challenge even in the most cooperative workplace environments. Rempel reports, “Our goal is to build a solid scientific database within the occupational medicine world to provide an evidence base for clinical decisions.”

Rempel co-authored a RCT published in the April 2009 issue of the *American Journal of Industrial Medicine* that evaluated multiple computer mouse and arm support configurations in more than 200 engineers. The study found that a mouse designed to reduce hand and wrist compression had a mild protective effect.

While nerve damage in the hand and wrist is a medical problem often associated with computer users, study authors say this population is not the only one affected. Assembly line workers, meat packers, power tool users—even cyclists—may be at risk for nerve damage at the wrist from forceful repetitive hand activity.

Rempel and **Niklas Krause**, both professors of medicine at UCSF, and **Craig Conlon**, MD, a PhD student at UCLA, followed the engineers who spent more than 20 hours a week working at a computer for an aerospace company in Los Angeles during 2002 and 2003.

Participants received one of four interventions: (1) a conventional mouse, (2) an alternative mouse, (3) a conventional mouse plus a forearm support board, or (4) an alternative mouse plus a forearm support board. Volunteers underwent nerve conduction testing at the beginning of the study and again a year later.

The test mouse proved to relieve pressure on the ulnar nerve. The interventions produced no significant impact on the median nerve, which is linked to car-

pal tunnel syndrome. Although previous research by Rempel found a reduction in arm, shoulder and neck pain with the use of a forearm support board, this study found no significant effect on the peripheral nerves.¹

“Most ergonomic studies use physical exams or self reported symptoms as the primary study outcome,” said Rempel. “This research was innovative because it was the first to look prospectively at an objective end point—nerve conduction at the wrist at the median and ulnar nerve—in a workplace RCT.”

In another RCT, Rempel and researchers from UCLA and the California Department of Public Health investigated chair interventions among a cohort of 560 sewing machine operators in Los Angeles, California, the largest garment production center in the United States.² Most garment workers work for small, non-unionized shops and spend long hours at non-adjustable workstations that lead to poor posture.³ The RCTs proved an adjustable chair with a curved seat pan could reduce back, hip, shoulder and neck pain among the study population of low-wage, mostly immigrant workers. 🔄



The mouse, developed in Norway, reduces pressure on the ulnar nerve by rotating the palm sideways instead of down.

¹ Conlon CF, Krause N, Rempel DM. A randomized controlled trial evaluating an alternative mouse or forearm support on change in median and ulnar nerve motor latency at the wrist. *Am J Ind Med.* 2009 Apr; 52(4):304-10.

² Wang PC, Ritz BR, Janowitz I, Harrison RJ, Yu F, Chan J, Rempel DM. A randomized controlled trial of chair interventions on back and hip pain among sewing machine operators: the Los Angeles garment study. *J Occup Environ Med.* 2008 Mar; 50(3):255-62.

³ Rempel DM, Wang PC, Janowitz I, Harrison RJ, Yu F, Ritz BR. A randomized controlled trial evaluating the effects of new task chairs on shoulder and neck pain among sewing machine operators: the Los Angeles garment study. *Spine.* 2007 Apr 20; 32(9):931-8.

Study Links “Dusty Trades” to Work Disability and COPD

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explained Blanc. “That differs from what we’ve seen in smoking and certain occupational cancer risks where the effect seems to be synergistic.”

Blanc and his team randomly recruited 233 subjects with self-reported, physician-diagnosed COPD along with a control group without the disease. They surveyed subjects to identify those exposed to vapors, dust, gas or fumes (VDGF). Using a JEM, researchers also classified whether the person had a low, medium or high probability of having had a COPD-related exposure on their longest-held job. Occupations with VGDF exposure were associated with more than a doubling of the odds of COPD. It accounted for almost a third of all cases in the study. From their findings, researchers calculated a population-level risk factor of 25%.⁵

Blanc was also lead author on a very large international ecological analysis examining the interrelationships between COPD, smoking, and occupational exposure. Blanc reports, “The results of the study show a consistent effect, even across a variety of locations. And that the effect is present among both men and women.”

That study, published in the *European Respiratory Journal*, uses a prevalence rate of 2.7% for COPD to predict that a 20% reduction in disease burden could result from a 5.4% reduction in overall smoking rates or an 8.8% reduction in the prevalence of occupational exposures.⁶ The ecological study re-analyzed data previously collected in 27 developed and developing countries involving more than 19,000 participants.

“To support the consistency of an association, you want to analyze questions from different approaches,” said Blanc. “This study shows that even if you take a population-based ecological effect, you can still see the association between occupational exposures and COPD prevalence.”

Blanc said it remains a challenge to tease out the relative contributions of smoking versus occupational exposures on a case-by-case basis. “The take home lesson is to encourage clinicians to ask patients questions about occupational histories, even in smokers.”

The message for policymakers, said Blanc, is that employees should receive appropriate compensation for work-re-

lated COPD and, as cigarette smoking becomes better controlled, occupational exposures will become increasingly important. 🌱

¹ Torén K, Zock J-P, Kogevinas M, Plana E, Sunyer J, Radon K, Jarvis D, Kromhout H, d’Errico A, Payo F, Antó JM, Blanc PD. An international prospective general population-based study of respiratory work disability. *Thorax*. 2009 Apr; 64(4):339-44.

² Facts About COPD, Centers for Disease Control and Prevention website.

³ Balmes J, Becklake M, Blanc P, et al. American Thoracic Society Statement: Occupational contribution to the burden of airway disease. *Am J Respir Crit Care Med*. 2003 Mar; 167(5):787-97.

⁴ Blanc PD, Torén K. Occupation in chronic obstructive pulmonary disease and chronic bronchitis: an update. *Int J Tuberc Lung Disease*. 2007 Mar; 11(3):251-57.

⁵ Blanc PD, Eisner MD, Earnest G, Trupin L, Balmes JR, Yelin EH, Gregorich SE, Katz PP. Further exploration of the links between occupational exposure and chronic obstructive pulmonary disease. *J Occup Environ Med*. 2009 Jul; 51(7):804-10.

⁶ Blanc PD, Menezes, AMB, Plana E, Mannino DM, Hallal PC, Torén K, Eisner MD, Zock, JP. Occupational exposures and COPD: an ecological analysis of international data. *Eur Respir J*. 2009 Feb; 33(2):298-304.

Ergonomics Graduate Students Honored

Molly Story, PhD, received one of the highest honors for an ergonomics student, the 2009 International Ergonomics Association (IEA) KU Smith Student Paper Award. The \$3,000 prize, received at the August 2009 IEA conference in Beijing, China, was for her paper titled, “Effects of table height and handholds on accessibility of medical examination tables for ambulatory elder patients with mobility disabilities.”

Master’s student **Amandeep Shergill**, an assistant clinical professor of medicine at UCSF, won the Young Investigator Research Award from the American Society

for Gastrointestinal Endoscopy. Shergill will use the \$60,000 award to study the ergonomics of colonoscopy.

Two PhD students, **Michael Wehner** and **Peiyi Ko**, each received \$20,000 for their research from the Occupational Health and Safety Research Training Pilot Project grants funded by NIOSH through the Southern California ERC. The titles of their projects were, “Lift-assist system to reduce spine loading for warehouse work,” and “Visual symptoms associated with computer monitor use.”

Carisa Harris Adamson, also a PhD student, received a Liberty Mutual Research

summer fellowship of up to \$9,500 from the American Society of Safety Engineers Foundation. Her research will develop and evaluate an alternative handle design for pallet jack operators.

“These awards are a mark of the creativity and academic excellence of the graduate students in COEH,” said **David Rempel**, professor of medicine at UCSF. “I am also impressed that our students have involved undergraduates in their research and have motivated them to consider graduate and professional work in occupational health.”

LOHP Increases Safety of Green Jobs

Everyone thinks of green jobs as universally good for the environment and the economy. But few realize that green jobs can generate occupational hazards, say the experts at the Labor and Occupational Health Program (LOHP), who reach out to protect workers of companies that are greening the way they do business.

While the term ‘green job’ is still in flux, certain elements apply. First, the job must have a positive impact on the environment and efficiently use natural resources. Second, it must be economically sustainable with a living wage that can support a family, provide health care and other benefits, and offer opportunities for advancement.¹

Pam Tau Lee, coordinator of public programs at LOHP, believes one way to assure green jobs are safe is to work with those directly affected by exposures to toxic substances. She participated in a workshop in September 2009 with a group of mostly Latino janitors employed in San Francisco, California. They asked her about the safety of a wax-stripping product they were using, which had a green seal certification. Lee found the cleaning product could be toxic if used incorrectly. She immediately trained workers to reduce their exposure through ventilation and the use of proper gloves. Lee’s work with low-wage, immigrant communities demonstrates LOHP’s hands-on and successful approach to greening the workplace.

Lee wants green jobs to take into account worker and community health. For instance, one of the major sectors of the green jobs revolution—solar panel installation—can be extremely hazardous due to the risk of falling from rooftops. “Installation companies will say they have safety measures in place, but enforcement remains a big concern,” said Lee. “There are not enough OSHA inspectors to ensure regulations are followed.”

LOHP is also part of the Green and Health Jobs project funded by the Center



Pam Tau Lee and LOHP have been developing a curriculum to address green jobs. Photo by Krisha Corbo.

for Construction Research and Training. **Helen Chen**, coordinator of public programs for LOHP, said project members are developing a comprehensive definition of green jobs that includes worker and community health criteria. They are also investigating workplace and community hazards in the green construction industry. In her role, Chen will identify key partners for research, education, and community action to promote worker and community health in green construction jobs.

In 2009, LOHP celebrates its 35th anniversary. “The period in which LOHP evolved was a period of great change in the United States,” said Lee. Always in tune with social and economic transitions, LOHP sees new opportunities in the green economy to prioritize the health and safety of workers and their families. 🌱

¹LOHP website, *Health and Safety and Green Jobs*

SIREN: Web-based Intervention to Reduce Noise Induced Hearing Loss in Firefighters

For most people, blaring sirens on city streets are a brief annoyance. Cover your ears and the pain goes away. For firefighters, however, excessive noise is a chronic exposure. COEH faculty member **Oisaeng Hong** says that approximately 20% will experience noise-induced hearing loss (NIHL) during their career.

Hong is the director of the Occupational and Environmental Health Nursing (OEHN) Program at UCSF. Her recent pilot study funded by the National Institutes of Health included focus groups with firefighters to identify noise sources and to understand attitudes toward hearing loss and the use of protective devices.

The results, published in the *Journal of Occupational and Environmental Hygiene*, reported that the loudest noise exposure for firefighters occurred while driving trucks with sounding siren and air-horn warning signals and operating powered tools used for forcible entry, ventilation and extricating activities.¹

While the firefighters acknowledged NIHL as a major occupational health problem, they did not perceive NIHL as their top health concern because it never resulted in mortality or lost workdays.

The majority of the firefighters said good hearing is crucial for firefighting because critical information is communicated verbally between dispatchers, firefighters, victims and other emergency response workers. All of the participating firefighters indicated they thought loud noise caused hearing loss, and that they knew someone who had hearing loss due to noise exposure at work. Still, firefighters were reluctant to use hearing protection because the devices might interfere with their ability to respond during an emergency.

“Fire fighting is hearing sensitive work,” Hong explained. “They have to be able to hear a victim crying, for instance, to locate someone in danger. Hearing loss can also put firefighters at risk for other types of injuries by reducing their ability to hear warnings. Reducing NIHL among firefighters, therefore, has the potential not only to improve quality of life and work



Truck sirens and air-horn warning signals are just two of the exposures that researchers identified as contributions to hearing loss in firefighters. Photo Courtesy of Oisaeng Hong.

safety, but also to reduce morbidity and mortality,” Hong emphasized.

With funding from the Department of Homeland Security, Federal Emergency Management Agency, Hong expanded her initial study into a three-year intervention project to develop the first online hearing protection training program for firefighters called S.I.R.E.N (Safety Instruction to Reduce Exposure of Noise and Hearing Loss). The program is on track for preliminary testing by firefighters in the Bay Area. In November 2009, her co-investigator, Dr. **Stephen Vogel**, an occupational medical physician at the NorthShore University Health Systems in Glenview, Illinois, will roll-out testing with 500 study participants from 15 fire departments in the northern suburb of Chicago, Illinois.

“The benefit of web-based learning is that the firefighters will have the flexibility to log-in from anywhere at the time most convenient for them,” said Hong. The program is designed for new firefighters and seasoned veterans.

Hong will also measure noise exposures in four fire departments in the San Francisco Bay area in collaboration with **Tom Rivard**, alumni of UC Berkeley’s School of Public Health and senior environmental specialist with the San Francisco Department of Public Health. Funding from the project will support two student research assistants

from the fields of industrial hygiene and OEHN.

Dana Drew-Nord Joins OEHN Faculty

Recent PhD graduate and occupational health nurse practitioner **Dana Drew-Nord** joined the OEHN faculty on a part-time basis for 2009-10 while she continues her occupational health research. Hong and Drew-Nord share a population of interest—firefighters.

Drew-Nord investigated sudden cardiac death, the main cause of mortality for on-duty firefighters, for her doctoral dissertation.² Using data collected over eight years as part of a Wellness-Fitness Initiative developed by the International Association of Firefighters and the International Association of Fire Chiefs, Drew-Nord’s study will be the first in nearly 20 years to publish on-duty cardiac monitoring results among career firefighters. Hong chaired Drew-Nord’s doctoral dissertation committee and will continue mentoring her future research efforts. 📞

¹ Hong O, Samo D, Hulea R, Eakin B. Perception and Attitudes of Firefighters on Noise Exposure and Hearing Loss. *J Occup Environ Hyg.* 2008 Mar; 5(3):210-15.

² Drew-Nord, D. (2009), Cardiovascular risk factors in career firefighters, unpublished doctoral dissertation.

What are Your Chances of Catching TB on a Plane?

Arriving on time with luggage in hand used to be the mark of a successful flight. That changed in May 2007 after an American diagnosed with a drug-resistant form of tuberculosis decided to fly to Europe for his wedding. Media coverage following the event left travelers with an extra worry—contracting tuberculosis (TB) aboard an aircraft.

A new study suggests the risk of transmission while flying is low, yet the more you travel the greater your risk. “There are people who travel 200 days a year,” said study author **Rachael Jones**. “Every time you travel you incur the risk and, therefore, increase your chances of exposure.”

Jones, a postdoctoral fellow at the School of Public Health at the University of Illinois, Chicago, specialized in infectious disease control while a doctoral student supported by a NIOSH traineeship and the Center for Advancing Microbial Risk Assessment (CAMRA) at UC Berkeley. CAMRA receives funding from the U.S. Environmental Protection Agency and the Department of Homeland Security.

Jones divided a Boeing 747 into seating quadrants and estimated the risk of infection from adjacent passengers or those walking past in the aisle. She also included scenarios where the plane’s air filtration system failed.

Jones found that passengers sitting next to someone ill or in the rear of the plane have the highest rate of exposure. The risk of transmission also increases while the plane is on the ground. “People start moving around, and the air conditioning system is much less effective,” she said. “Concentrations of microorganisms tend to increase.”

Jones reported that flight crews are also susceptible. In addition to frequent flying, they respond to persons that are ill, putting them in close proximity to airborne organisms.

“The only prevention strategy for tuberculosis is to wear a N95 respirator mask,”



Frequent travel increases risk of TB exposure

added Jones, “the type used for dusty trades that you can buy at most hardware stores.”

The study, appearing in the March 2009 issue of *Risk Analysis*, is the first to use quantitative microbial risk assessment to predict the likelihood of contracting tuberculosis from seated and moving airline passengers and the impact of cabin air filtration systems. 🙄

Jones RM, Masago Y, Bartrand T, Haas CN, Nicas M, Rose JB. Characterizing the risk of infection from Mycobacterium tuberculosis in commercial passenger aircraft using quantitative microbial risk assessment. Risk Anal. 2009 Mar;29(3):355-65.

COEH Investigator Conducts Multidisciplinary Research on Chemical Exposures (Continued from Page 4)

exposure. “Our results point to the presence of such an enzyme,” he added. “And since everyone is exposed to low levels of benzene, this could be important.” In fact, the U.S. Environmental Protection Agency cited Rappaport’s findings as justification for reducing the allowable content of benzene in gasoline in 2007.

Rappaport also wrote a provocative editorial in the July 2009 issue of *Occupational and Environmental Medicine*.² It drew attention to the historical contribution of four early researchers in the field of industrial hygiene— B.M. Wright, S.A. Roach, P. Oldham and W.M. Long—who published groundbreaking results during the 1950s in the *British Journal of Industrial Medicine*, later named *Occupational and Environmental Medicine*. Despite primitive methods for sampling airborne dust, these early investigators measured dust exposure in large numbers of British coal miners and used the data to study the origins of coal-workers pneumoconiosis, also called “black-lung disease.” Since publication of these early studies, a variety of devices have become available for easily measuring toxic dusts and other chemicals in air. Yet, in his commentary, Rappaport observed that since the 1980s only “13% of epidemiologic studies of chronic diseases used any exposure measurements, and even those relied on small numbers of measure-

ments.”² He concluded that “we’re doing a particularly poor job of measuring occupational exposures today, with the unfortunate result that workers are unnecessarily suffering the effects of excessive exposures.”

¹ Rappaport SM, Kim S, Lan Q, Vermeulen R, Waidyanatha S, Zhang L, Li G, Yin S, Hayes RB, Rothman N, Smith MT. Evidence that humans metabolize benzene via two pathways. *Environ Health Perspect.* 2009 Jun; 117(6):946-52.

² Rappaport SM. Assessing workplace exposures: turning to the past for guidance. *Occup. Environ. Med.* 2009 Jul; 66(7):429-30.

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COEH CENTER FOR OCCUPATIONAL
& ENVIRONMENTAL HEALTH
University of California at Berkeley, San Francisco, and Davis

Protecting workers and communities from occupational and environmental health hazards through teaching, research, and service

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.

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