DIACETYL EMERGES AS AN OCCUPATIONAL HEALTH HAZARD IN CALIFORNIA

Occupational health professionals—including several COEH graduates from industrial hygiene, medicine, nursing, and health education—have been collaborating with COEH faculty and many others to aggressively address hazardous and potentially fatal exposure to a butter-flavoring chemical affecting workers in California’s flavor manufacturing industry.

The agent in question, diacetyl, occurs naturally in butter, and in a concentrated synthetic form in the food industry as a butter flavoring. Although severe lung disease was identified in exposed workers more than 20 years ago, the causative chemical agent was not identified at that time (MMWR, 2007). Diacetyl has now been identified as the most likely culprit; exposure to the chemical, as a vapor or when contained in particles, has been found to cause a rare, severe, and irreversible lung condition called bronchiolitis obliterans. Because of this risk, efforts are underway to curb exposure, including a California Division of Occupational Safety and Health (Cal/OSHA) regulation, and two state legislative proposals intended to ban the use of diacetyl in the workplace or completely.

“It’s a very urgent issue because of the severity of the disease,” said Barbara Materna, chief of the Occupational Health Branch of the California Department of Public Health (CDPH). Obstructive lung disease caused by diacetyl exposure has so far occurred largely in young, nonsmoking workers in low paying jobs, several of whom can no longer work because of the disease.

Diacetyl first came to the attention of occupational health experts in 2000 when the Missouri health department received reports from a physician regard-
Failure to Respond When “Only” Workers Are at Risk Must Change

One of the lessons that I have learned over the course of my career is how little societal interest there is in occupational health in the United States. While there can be tremendous media attention focused on potential health problems related to environmental exposures as demonstrated by a New York Times Magazine cover story about “toxic” mold contamination in homes (8/12/01), little coverage will be given to stories of devastating illness in workers occupationally exposed to a toxin. Around the same time that the Times article about mold-related illness appeared, the National Institute for Occupational Safety and Health (NIOSH) was investigating a microwave popcorn manufacturing plant in Missouri where there was a cluster of workers with a rare, but severely debilitating lung disease, bronchiolitis obliterans. The results of this investigation, published in the prestigious New England Journal of Medicine in 2002, strongly suggested that the butter flavoring, diacetyl, was the causative agent. Subsequent animal toxicological studies confirmed the capacity of this chemical to cause airway injury. Because diacetyl is widely used as a flavoring, NIOSH was appropriately concerned about workers engaged in food processing other than microwave popcorn manufacture. They then distributed a Health Alert on “Preventing Lung Disease in Workers Who Use or Make Flavorings” in 2004 to warn of the hazard. The agency approached the Flavoring Extract Manufacturers Association (FEMA) with a request to conduct an industry-wide study, but was rebuffed. As noted in our cover story, NIOSH staff was eager to assist the California Department of Public Health and Cal/OSHA in the investigation of the new cases of bronchiolitis obliterans in our state.

Industry resistance to removing diacetyl from microwave popcorn and other products continued, however, even after Cal/OSHA began consideration of new regulation to control diacetyl emissions, and legislation was introduced in the California legislature. Suddenly last summer, years after diacetyl was shown to have led to severe illness in occupationally exposed workers, the three largest microwave popcorn producers announced that they would be removing diacetyl from their products. What caused this sudden change of heart? FEMA’s worst nightmare occurred. The first case of bronchiolitis obliterans in a consumer of microwave popcorn was found by a physician who was also a consultant to FEMA. The ensuing media attention about the risk of diacetyl exposure to the general public caused the industry to remove the agent from its products. When it was merely workers who were at risk, there was insufficient incentive to change. The lack of interest in the health and safety of workers in our society is truly staggering. While the National Institute of Environmental Health Sciences and the U.S. Environmental Protection Agency will spend hundreds of millions of dollars on studies of the health effects of environmental exposures, NIOSH has only approximately $5 million to devote to new extramural research on occupational health and safety during this fiscal year. Why does this disparity exist, that our society is willing to prevent environmental hazards that threaten the public at large but not when they threaten only workers?

The answer lies in the fundamental values of our society, the power of the profit motive, and the politics that ensue. It is way past time that we stopped allowing workers to be canaries in the mine shaft. ☹️
The Occupational Health Internship Program (OHIP), directed by Robert Harrison and coordinated by Gail Bateson, received a financial boost with the award of a three-year training grant from the National Institute for Occupational Safety and Health (NIOSH). Modeled after a successful program established in the 1970s by Anthony Mazzochi of the Oil, Chemical & Atomic Workers Union, OHIP is a summer internship for undergraduate and graduate students with an interest in occupational and environmental health. Typically, 10 interns are selected each year, one of whom is funded by COEH.

The curriculum provides trainees, placed at sites across the country, with an eight-week experience where they are introduced to toxicological, physical, and work organization hazards that play a role in determining occupational health risks to workers. The participatory model, upon which OHIP is built, gives students a meaningful experience in which they interact with workers as well as occupational health professionals. This is a critical element of the curriculum as it allows students to view occupational health and safety issues from different perspectives, giving them a more complete contextual understanding and well-rounded experience.

At the end of the program, students summarize their experience in a paper and presentation. They also produce educational or training materials relevant to their project that are designed to improve workers' knowledge of health and safety hazards.

The program receives applicants from across the country, and trainees come from diverse backgrounds and educational institutions. Graduates of the program are now working in academic public health programs, a labor union, and a state health department. Three recent interns, Jennifer Borden, Beth Goldstein, and Henning Chu, applied and were accepted into the University of California, San Francisco, Occupational and Environmental Health Nursing Program.

Harrison and Bateson, along with regional coordinators in New York, Los Angeles, Washington, D.C., and Berkeley, are prepared to meet new challenges with the NIOSH funding. Ongoing support and start-up funds were received from the Occupational Health Branch of the California Department of Public Health, Kazan Foundation, Wellness Foundation, and COEH.

For more information on the OHIP Program, visit the website at www.aoec.org/ohip/

Correct Respirator Placement

In the June 2007 issue of Bridges, we featured a picture of an improperly placed respirator. Seen to the left is a picture of a properly donned disposable N95 filtering face piece respirator. To be properly worn, the respirator must be correctly oriented on the face, with no facial hair present, and be positioned with the straps correctly placed with the upper strap high on the head and the lower strap below the ears. In addition, the straps should be placed under (not over) the hood of a Tyvek® suit or hair, if hair is long.

Diacetyl Continued (from page 1)

Eight cases of bronchiolitis obliterans were identified as well as a group of other workers with abnormal spirometry tests that are being evaluated to assess whether or not they may be in the early stages of flavoring-related disease.

After the second case was identified, however, “CDPH moved forward quite quickly to assure rapid and thorough notification of involved parties,” said Materna. Julia Quint, then chief of the Hazard Evaluation System and Information Service (HESIS) at CDPH, following its critical mandate to alert the public to emerging occupational hazards, developed the Diacetyl (Butter Flavoring Chemical) Health Hazard Alert—the first government publication to specifically highlight the toxicity of this chemical. Quint and CDPH health educator David Harrington then led a statewide outreach campaign to distribute information on diacetyl in English and Spanish. Through mass mailings and email distribution lists, HESIS was able to reach more than 700 employers, approximately 4,000 workers, and almost 700 health care providers.

Subsequently, Janice Prudhomme, a physician with HESIS, initiated work with UCSF Professor of Medicine and COEH Director John Balmes to assess the capacity of California medical providers to conduct surveillance for lung problems caused by occupational exposures. After identifying the number of medical providers caring for flavor manufacturing workers, Balmes, Rossana Segovia-Bain, assistant clinical professor in the UCSF School of Nursing, and Patricia Quintan, industrial hygienist and associate clinical professor in the UCSF School of Nursing, began a pilot assessment. “The ultimate goal of the project,” said Prudhomme, “is to train clinicians to better recognize and monitor workers for work-related respiratory illnesses using spirometry and to improve their ability to conduct surveillance and follow-up for such illnesses.”

In addition, Fran Schreiber, an attorney with the worker advocacy group WorkSafe, has been urging legislative or regulatory action to control diacetyl. “This issue was of concern to us because many of the cases were low-wage immigrant workers,” said Schreiber. “It was disparately impacting this vulnerable population.” When petitions were filed by several labor organizations for a Cal/OSHA standard, WorkSafe became involved in the regulatory process on behalf of several legal services programs and also assisted California Assembly member, Sally Lieber, in writing AB514, legislation to ban diacetyl in the workplace. Federal legislation is also now pending in both the House and Senate to require Federal OSHA to develop a standard to protect workers from exposure to diacetyl and other potentially hazardous flavorings.

HESIS physician Janice Prudhomme continues to work on this issue by providing medical expertise to Cal/OSHA regarding a written standard and by developing guidelines for health care providers that will help them recognize diacetyl-related illness in its earliest stages. In participating factories, workers are now wearing respirators, and management is putting other control measures, such as proper ventilation, into place. Such actions will address not only diacetyl, but other flavoring chemicals that may also be airborne hazards. As a result, “We’re altering the course of the illness; we may never see these cases progress,” said Prudhomme. If successful, such activities will be a testament to the effectiveness of interdisciplinary clinical, research, and policy collaboration.

Acknowledgements: COEH would like to acknowledge the hardships faced by workers who have been exposed to diacetyl. Many professionals and organizations in California have made important contributions regarding this devastating occupational illness. Although space constraints limit our ability to name all contributors, COEH would like to acknowledge Members of the Cal/OSHA Diacetyl/Flavoring Advisory Committee, Flavor and Extract Manufacturers Association of the United States, Phillip Harper (UCLA), Robert Harrison (OHB - CDPH), and dedicated researchers, clinicians, and staff of NIOSH, National Jewish Medical Center, Cal/OSHA, and CDPH.

For more information, please see: http://www.dhs.ca.gov/ohb/flavorings.htm

COEH Researchers Develop Portable, Inexpensive Particle Monitor

Global Environmental Health Professor Kirk Smith from University of California, Berkeley and post-doctoral scholars Rufus Edwards and Zohir Chowdhury (now faculty members at University of California, Irvine and San Diego State University, respectively) along with collaborators at Electronically Monitored Ecosystems (a Berkeley firm) and the National Institute for Occupational Safety and Health (NIOSH) have developed a portable and inexpensive data-logging air particle monitor, which they have dubbed the “UCB,” after the University of California, Berkeley. The monitor “provides a significant advance in the capacity to estimate adverse health effects from indoor smoke exposures in developing-world settings;” the researchers explained in a paper published in the Journal of Environmental Monitoring in October, 2007.

In underdeveloped communities around the world, millions of households rely on solid fuels for cooking and heating needs. Exposure to high concentrations of airborne particles generated by such fuel results in respiratory infections, cataracts, chronic lung disease, low birthweight, and other serious health problems. Measuring airborne particles is therefore critical in determining the risks of disease due to such exposures in different settings as well as evaluating potential measures to reduce exposures.

At present, commercially available monitors are impractical for widespread use. They are expensive, noisy, difficult to use, and require laboratory support. They can only be deployed for a day or two at a time and provide only an average concentration at the end. Monitors that log continuous data are available, but they are costly, heavy, and encumbered by short battery lives, making them impractical for use in many settings.

To solve these problems, the researchers developed the small, light “UCB” by bringing together three commercial and affordable technologies now sold in the hundreds of millions around the world: smoke detectors from household smoke alarms, microchips for logging data, and personal computers. As the markets for these separate technologies are so large, the performance per unit cost in each case has increased by hundreds of times in recent decades.

The researchers also developed “firmware” for the programmable chip inside of the monitor, which records continuous data on particles emitted, as well as software for launching the monitors and downloading, processing, and displaying the collected data. To field test the device, they compared its performance with that of commercially available devices at research sites in Mexico and Guatemala.

In rural Mexico, where the researchers were involved in evaluating the environmental and social impacts of switching households to less-polluting stoves, they tested the “UCB” in controlled test chambers and in several households with open-fire kitchens. In the rural Guatemalan highlands, where they conducted a large study of indoor pollution and respiratory effects several years ago, the researchers monitored households for particulate matter and carbon monoxide, placing two “UCBs” in each household.

In both settings, measurements collected by the “UCB” agreed well with that collected by the standard devices, such as the commercial monitor known as the DustTrak™.

“The availability of personal computers, even in rural areas of developing countries,” they wrote, “makes it possible now to deploy the “UCB” widely for particle research in parts of the world that have, to date, been poorly characterized.”

Moreover, because this inexpensive device is also robust, easy to deploy, smart (i.e., programmable), and long lived (i.e., low battery drain), it allows entirely new types of research to be done. For example, children can take monitors home from school, multiple devices can be placed for long periods in remote locations, and they can even be distributed by mail.

Household in Guatemala with a “UCB” monitor installed.

As a condition of the grant from the Shell Foundation under which the “UCB” was developed, the device will be sold on a cost-plus basis to developing-country researchers and community groups. This is now being done through the Center for Entrepreneurship for International Health and Development (CEIHD), a Berkeley non-governmental organization associated with the School of Public Health. See http://ceihd.berkeley.edu/

The “UCB” is not sensitive to particle levels less than 50 µg/m3, making it unusable in the relatively clean conditions of most developed countries. The team has recently received a grant from the California Air Resources Board, however, to extend its lower range of sensitivity to enable environmental justice community groups to detect particles present in California environments.
Center for Exposure Biology to Open on Berkeley Campus

This fall, University of California Berkeley became home to the Center for Exposure Biology (CEB), one of a few centers funded by a new program of the National Institutes of Health (NIH), the Genes, Environment and Health Initiative. Stephen Rappaport, adjunct professor of environmental health sciences, directs the Berkeley CEB, which will focus on new methods for investigating gene-environment interactions. Joining Rappaport in these efforts are School of Public Health faculty Martyn Smith, Mark van der Laan, and Louping Zhang, College of Chemistry Professors Richard Mathies and Evan Williams, and Department of Electrical Engineering and Computer Sciences Professor Bernhard Boser.

Under a four year $4.7 million grant, the Center will focus on three specific projects: assessment of protein adducts (i.e., compounds formed by reactions between blood proteins and toxic chemicals) to identify initiators of human lymphomas; development of lab-on-a-chip microsystems to perform genetic analysis on single cells to detect mutations that can lead to leukemia and lymphoma; and the development of a portable biosensor for measuring protein adducts of toxic chemicals in a single drop of blood.

Rappaport is principal investigator on the first project, assisted by Williams and van der Laan. The study will investigate whether people with lymphoma have higher levels of adducts of albumin, a blood protein. This has broad application as chemicals that enter the body through air, water, or food intake can find their way into the bloodstream, where they may be metabolized into highly carcinogenic forms. These carcinogens are very reactive and can bind to reactive sites on proteins, forming protein adducts. By profiling levels of these adducts in lymphoma cases and controls, the team hopes to identify possible initiators of human cancers.

“If people with lymphoma have high levels of adducts, that would suggest that these particular alterations are related to the disease and may have initiated the disease,” Rappaport explained. His team will also collaborate with colleagues in the chemistry department to determine which chemicals could have caused the altered proteins—and ultimately the cancer.

The second project, led by Mathies with collaborations from Smith and Zhang, will develop a method for “amplifying” the genetic material of a single, cancer-susceptible cell—even if that cell is surrounded by millions of normal cells. In a blood sample taken from a healthy person, the vast majority of cells will be normal, or lacking genetic mutations that indicate a risk of disease, such as leukemia. By devising a method for amplifying the signal from what may be a sole leukemia-susceptible cell in a sample, Mathies and colleagues hope to uncover the specific genetic mutations that are key to the development of leukemia. In the past, CEB collaborators have worked on two large, population-based studies of blood cancers with University of California San Francisco and UC Berkeley colleagues, and will rely on blood samples from these cohorts for their current work. If this project is successful, this will be the first time that polymerase chain reaction, a common method of DNA analysis, will be performed on individual cells.

Lastly, the development of an affordable, portable biosensor is key to making biomarker measurements a feasible part of large epidemiological studies. The development of such a system is the focus of the third project, led by Bernhard Boser with collaborations from Mathies and Rappaport. Biomarkers are chemical compounds or their damage products whose presence in blood or urine indicate a particular chemical exposure. Currently the technology for measurement is expensive and cumbersome, requiring large volumes of blood or urine. The researchers aim to produce a system that can detect biomarkers in as little as a single drop of blood—even if that blood has been stored as a dried spot.

“With a simple finger lance, you would be able to collect one drop of blood and measure hundreds or thousands of biomarkers related to different chemicals in the environment,” explained Rappaport, who has spent the last twenty years studying biomarkers. This technology could be especially useful in remote locations—such as those used in many COEH-related projects.

Multidisciplinary research—including collaboration between the physical and health sciences—has been identified as a top goal on the Berkeley campus. Rappaport said the CEB dovetails with this aim: “This Center, we think, will be a locus for many new collaborations between scientists in public health, chemistry, and engineering,” he said. In addition, Rappaport and colleagues plan to train several graduate students through the CEB, ensuring that a new generation of scientists will continue groundbreaking work.

Parts of this story adapted from UC Berkeley news release by Sarah Yang.
A significant aspect of Eisen’s work has been the application of statistical “smoothing” techniques to address unusual data patterns in the exposure-response relationship driven by the Healthy Worker Survivor Effect (HWSE)—a common bias in occupational health studies. Smoothing techniques, such as piecewise polynomial regression, are flexible ways of describing data that can clarify relationships observed between exposures and outcomes.

In the case of HWSE, workers with adverse health events will often leave the workplace sooner than healthier coworkers, thereby avoiding long-term exposures. “This means that when you compare health status between workers with more and less exposure,” Eisen stated, “you often find that workers who have stayed around and accumulated the highest exposures have less disease than coworkers with less exposure. And that’s a real problem when you’re trying to understand how environmental exposures at the workplace impact health.”

Currently Eisen leads a long-term cohort study of 50,000 autoworkers that investigates the health effects of exposure to metalworking fluids. Her research focuses on the impact of exposures on the risk of developing respiratory and digestive cancers as well as nonmalignant respiratory disease. This study reported an association between synthetic metalworking fluid and work-related asthma. The ongoing study has also found causal links between lifetime exposure to oil-based fluids and laryngeal, rectal, and prostate cancer.

Recently NIOSH awarded Eisen a grant to fund her research with autoworkers for another three years.

Ellen Eisen, a leading biostatistician from Harvard University, to COEH. Though Eisen is new to UC Berkeley, her affiliation with COEH goes back many years—having worked with Katharine Hammond on a large cohort study of autoworkers and served with Patricia Buffler and John Balmes on advisory groups and in professional organizations.

Eisen chairs an advisory board for the National Cancer Institute. In addition, she has been a panel member on several National Academy of Science committees and has served on the Board of Scientific Counselors for the National Institute for Occupational Safety and Health (NIOSH). Eisen received an M.S. and Sc.D. from Harvard University in Biostatistics with a focus on occupational health. She also holds an M.S. in operations research and statistics from the Massachusetts Institute of Technology and was professor of epidemiology in the Department of Work Environment at the University of Massachusetts Lowell.

Eisen specializes in complex dose-response modeling for occupational and environmental health. Her research approach draws on methods from statistics, environmental health, and epidemiology. She is particularly interested in using innovative statistical methods to improve analysis of dose-response data.

Eisen has also conducted research on the respiratory health of granite workers, linking silica dust to reduced pulmonary function and accelerated annual decline in lung function, particularly among those who stopped working. Her earliest work proved that variability in the volume of air that can be expelled from the lungs in one second was a biomarker of impaired lung function, leading the American Thoracic Society to revise their recommendations for Standardization of Spirometry. Results of spirometry tests impact patient treatment and disability compensation. Researchers now use the standard in many studies of respiratory disease.

Ellen Eisen: Biostatistician Connects Exposures to Health Outcomes
University of California, San Francisco (UCSF) and University of California, Berkeley researchers recently published findings that strengthen the link between secondhand smoke (SHS) exposure and declines in lung function. The study also showed that exposure increases the risk of death from cardiovascular disease. Though many studies have explored the association between SHS exposure and lung function, the literature has thus far been inconclusive due to studies that were either too small, looked at an insufficient time period, lacked statistical power, or had other limitations.

Researchers Mark Eisner, John Balmes, Ira Tager, and Katharine Hammond, whose work was supported by UCSF’s Bland Lane Flight Attendants Medical Research Institute (FAMRI) Center of Excellence, used data from a large (more than 1,000 participants in this wave of the study), prospective cohort study of older adults to address such shortcomings. “It was really an ideal cohort for exploring the pulmonary and cardiovascular effects of SHS exposure,” said Eisner, lead author of the study and associate professor of medicine at UCSF.

The cohort was originally enrolled in a 1992 study on healthy aging. Researchers followed participants for nearly 10 years, responding to questions regarding their exposure to SHS at home and in the workplace. In addition, they had their lung function tested as many as four times over the study period.

When the researchers analyzed the data from the cohort, they found that SHS exposure both at home and in the workplace was associated with a decline over time in Forced Expiratory Volume in one second (FEV₁), a commonly used measure of lung function. For every ten years of exposure in the home, FEV₁ declined by 15 ml/sec. Thus, if subjects had been exposed to SHS at work over a 40 year period, their lung function would be approximately 5% lower than expected. Though antismoking laws have nearly eliminated such exposures in California, some members of the cohort may have worked in environments—such as bars or restaurants—where exposures were four to six times higher than those encountered at home, even for those living with smokers.

Further, researchers demonstrated that exposure to SHS is associated with an increased risk of death from cardiovascular (CV) disease. Most strikingly, participants with no history of CV disease experienced a 36% increased risk of death from heart disease for every 10 years of exposure to SHS smoke at home. For all participants, including those with a history of CV disease, the risk of death from CV disease increased 6% for every 10 years of exposure to SHS at home.

Eisner pointed out that other researchers have shown that even short-term exposure to SHS—as low as 30 minutes—can cause platelets to adhere and aggregate, and coronary arteries to constrict, possibly precipitating CV events. Eisner’s findings, then, provide policymakers “more evidence that even low levels of exposure for short time periods could be worrisome. And it gives more credence to efforts to prohibit smoking in public places.”


The study found that exposure to secondhand smoke in the workplace resulted in reduced lung function. Photo by Mike Clarke.
Five Years of Funding for the UCSF Bland Lane FAMRI Center of Excellence

The University of California, San Francisco (UCSF) Bland Lane Flight Attendants Medical Research Institute (FAMRI) Center of Excellence received word in July 2007 that its funding will be renewed—and increased—for another five years. It conducts multidisciplinary research into the health effects of secondhand smoke (SHS) exposure.

The national FAMRI program was established as part of the settlement of a 1991 class action suit brought against the tobacco industry on behalf of flight attendants exposed to SHS in airline cabins. In 2002, UCSF became the first of three institutions to receive funding to establish a FAMRI-supported research center.

“People think that we’ve dealt with secondhand smoke, yet people still smoke in their homes and expose their kids and adult loved ones,” said Center investigator and UCSF Professor John Balmes. “Plus, there are still a lot of places where you can smoke in public. It remains an important public health problem—one that many tend to forget about.”

It is also a problem that researchers from UCSF Bland Lane FAMRI Center of Excellence have done much to address. Projects led by COEH scientists Mark Eisner and Ira Tager, and including John Balmes and Katharine Hammond, showed that SHS exposure is a risk factor for lung function decline and cardiovascular disease mortality. Drs. Eisner, Balmes, and Hammond, along with COEH investigators Ed Yelin and Paul Blanc, used both a biomarker of exposure (urinary cotinine) and personal monitoring for nicotine to show that people with chronic obstructive pulmonary disease (COPD) suffer worse outcomes if they continue to be exposed to tobacco smoke following the development of COPD.

The new funds—totaling $1.75 million per year for five years—will enable the UCSF and University of California, Berkeley researchers to continue to study the impact of SHS on COPD, quantify the economic burden of SHS-related disease, and investigate how training legislators on the science of tobacco exposure influences antismoking legislation. In addition, FAMRI Center researchers are planning to study the impact of SHS to vehicle passengers, the upper and lower airway inflammatory effects of acute exposures to SHS, and whether genetic markers of risk and SHS exposure combine to worsen the severity of asthma.

Links to the clinic and other tobacco resources at UCSF can be found at: http://tobacco.ucsf.edu/

The UCSF Bland Lane FAMRI Center of Excellence on Secondhand Smoke was recently renamed in memory of Bland Lane, a flight attendant of 46 years who developed serious health problems as a result of SHS exposure.

United Nations Association Award Goes to COEH Student Project

The East Bay chapter of the United Nations Association (UNA) has selected an interdisciplinary group of University of California, Berkeley students to receive their 2007 Group Global Citizen Award. This award honors individuals and groups in the East Bay whose efforts contribute to achieving the United Nations’ Millennium Development Goals.

As reported in the January 2007 issue of Bridges, this remarkable group of undergraduate Public Health students initiated a project aimed at identifying and implementing health interventions to improve the drinking water and sanitation practices of indigenous Shuar villagers living in remote areas of Ecuador. A COEH Student award launched their project in 2006, followed by funding awards from UC Berkeley’s BIG Ideas initiative and the UC Berkeley Blum Center for Economic Development. They have now expanded into a multi-disciplinary team of public health, engineering, Spanish, and anthropology students. Last summer, 25 students traveled to Ecuador to implement a rain collection system they designed for drinking water and to conduct educational sessions on hygiene and sanitation for mothers and children. Their next goal is to build household latrines.

Founding public health student members of the team are Lia Marshall, Karis Miyake, Rebecca Kehrer, David Reynoso, and Tim Morrison. New leaders are Laura Reynolds, Alixa Fraser, and Celeste Wong, and engineering students Mike Fisher, Jessica Granderson, Alisar Aoun, and Tim Suen.

UC Berkeley Professor David McGaffey, chair of the UNA selection panel, congratulated the students by saying, “Our theme this year is Water for Life! and your work is a wonderful example of what can be done to bring water and life to everyone sharing this planet.”

The East Bay UNA, established nearly 50 years ago, is one of 175 national chapters that participate with more than 70 countries in the World Federation of United Nations Associations to educate, inspire, and mobilize US residents to support the principles and vital work of the United Nations. For more information about UNA-East Bay, visit www.unausaeastbay.org.
Help is on the Way for Homecare Workers

Homecare workers in the United States range from those employed by agencies, to independent caregivers, to family members. Training for them about care-giving and workplace hazards is often informal and non-regulated, if it occurs at all. This workforce includes many non-English speaking immigrant workers, so there are challenges in communicating healthy practices. Furthermore, workers in this trade may be at higher risk of injury than other workers, and the homecare industry is growing, putting more workers at risk.

The Labor Occupational Health Program (LOHP), under the direction of Associate Director Laura Stock, has just completed the first phase of a five-year project to address these needs. The project uses community-based participatory research methods to pilot test and evaluate interventions for homecare workers employed by the Alameda County Public Authority's In-Home Supportive Services unit.

An earlier pilot study, conducted by LOHP with support from the National Institute for Occupational Safety and Health (NIOSH), identified unique problems that homecare workers face through focus groups and interviews with workers and consumers. Both groups cited lifting and other difficult physical activities such as housekeeping tasks, exposure to household chemicals, and unsafe work environments as key issues. Researchers found that workers were unaware of simple assistive devices that could help them, and that often the consumers' homes were not well-equipped for patient care and homemaking tasks.

The current project is using focus groups, key informant interviews, and community experts to develop a health and safety checklist to identify workplace hazards in housekeeping and care giving tasks, for example, as well as a resource guide for homecare workers and their clients to help reduce these risks. The focus groups and interviews are conducted in three languages—English, Spanish, and Cantonese.

To validate their pilot findings, Stock organized stakeholder meetings with the Service Employees International Union (SEIU), NIOSH, and community groups who work in immigrant, elderly, and disabled communities to discuss and identify key issues from their perspective. “This process will help us ensure that our materials meet the needs of this diverse, multilingual, multicultural population,” says Stock.

In the coming year, the group will put together a team of what they call “community health researchers” composed of health care workers and consumers representing each of the three language groups to begin field testing the materials. Researchers will also be developing strategies based on social marketing principles to help consumers and workers become aware of the importance of caregiver health and safety, motivate them to use project materials, and help recognize that they have the power and ability to make changes in the home environment. Researchers may use posters, photo novelas, video or audio pieces, community events, or peer mentor programs within the union or other trusted community-based organizations to facilitate change.

Partners on this project include NIOSH, SEIU, the Alameda County Public Authority, and local community organizers.

Overhead Drilling Project Enters New Phase

University of California San Francisco (UCSF) Medicine and Bioengineering Professor David Rempel and two members of the Ergonomics Program research staff, Alan Barr and Demetra Star, are developing their fourth generation overhead drilling device designed to reduce musculoskeletal problems from forceful and awkward postures associated with older style drills. Development of this tool is part of an ongoing project to decrease injuries in the construction industry.

The researchers, funded by the Center to Protect Worker’s Rights through a cooperative agreement with the National Institute for Occupational Safety and Health (NIOSH), have partnered with approximately 45 commercial construction workers and contractors using interviews, observation, and field testing. According to Rempel, “The feedback from experienced construction workers has been critical to our work, especially with regard to improving the device design.”
The hammer drills in current use for overhead boring into concrete are heavy, and they have no positioning support when used overhead. The redesigned tool includes a support device that requires no adaptation to existing drills—making this an attractive user feature. Based on feedback from construction workers, it also includes a superior height adjustment system and a three wheel base that reduces the risk of tipping, yet still allows maneuverability. Researchers also added a dust control system to the drill to prevent debris from falling on operators. Worker productivity and fatigue were assessed as part of the design process, helping to assure that the final prototype will meet usability demands.

The new tool, which can drill into 15 foot ceilings, will be fabricated and field-tested over the next year. Subsequently, Rempel and colleagues will then source a manufacturer to produce the apparatus to specification.

In 2006, a two-year research grant from WorkSafe BC (British Columbia’s Worker’s Compensation Board) offered Rempel the opportunity to partner with Simon Fraser University researcher Stephen Robinovich on another intervention research project focused on developing a similar system.

Bates Launches Hydrogen Sulfide Project in New Zealand

Adjunct Professor of Epidemiology Michael Bates, in partnership with researchers in both Rotorua and at the University of California, Berkeley, has set out to identify the effects of long-term, low-level exposure to hydrogen sulfide (H₂S) in Rotorua, New Zealand. The hot springs, geysers, and mud pools of Rotorua result from local geothermal activity and release H₂S. Although the hot springs and geysers are long claimed to have therapeutic benefits, the risks associated with human exposure to H₂S are unknown. The researchers’ findings will be important to people and communities worldwide who are exposed to H₂S from numerous sources including sewage treatment plants, paper mills, oil and gas refineries, and so-called “factory farms,” that raise animals in confining environments.

Now in their second year of funding, the project will soon begin recruiting participants who will be tested for possible respiratory, ocular, and nervous system effects from exposure to H₂S. Partnerships within the community have been an important part of their recruitment plan. Local general medical practitioners are assisting the team by facilitating recruitment. “This collaboration will make it much easier to access potential study subjects from the Rotorua population” says Bates. Investigators have also been engaging Government ministries, the mayor and town council, as well as representatives of the local Maori tribe, to discuss the study and the possible community impact of exposures.

Researchers anticipate participation in the study to take up to three hours per person, including questionnaire completion, eye examination, and testing for peripheral neuropathy, lung, and neuropsychological function. The researchers will not provide treatment for health problems detected, but will offer referrals as needed. Participants’ lung function will be re-measured in the final and fifth year of the study.

In the last phase of the study, Bates’s team will evaluate the distribution of H₂S across the geothermal field with regard to participants’ residential and work histories. “We’ll be modeling the distribution across the geothermal field in much more detail than has ever been done before to get a complete longitudinal profile of people’s exposures,” says Bates. “Certainly, determining people’s exposure history will be the most difficult part of this study.”

Bates’s research is important to understanding the impact of H₂S exposure, not just on Rotorua residents, but in communities around the world with exposure to this potentially harmful gas.
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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