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Bridges

JUNE 2003

Study Relates Cooking Smoke to Cataracts

Smoke from household cooking fuels and lack of ventilation increases the risk of cataracts, a COEH graduate student has found.

With support from a $5,000 COEH Student Project Award, Amod Pokhrel, a master's degree candidate in Health, Environment and Development (HED) at UC Berkeley, returned to his native Nepal last summer to study women patients between the ages of 35 and 65 at the Lumbini Rana-Ambika Eye Hospital in Bhairahaba, on the border of Nepal and India.

Comparing more than 200 Nepalese and Indian women with cataracts to a cataract-free control group of the same size, Pokhrel found that women who use solid fuels like wood, cow dung, or coal for cooking, prepare food in poorly ventilated cooking areas, and live in a rural location are at significant risk for developing cataracts, regardless of their age.

First Environmental Study

Pokhrel's research is the first to focus in detail on environmental hazards that may increase the risk of cataract development. His findings are particularly stunning when one considers that cataract is a major cause of blindness in the world today, accounting for more than 50 percent of the world's burden of blindness.

The World Health Organization estimates that about 90 percent of the blind people in the world live in developing countries. A projected 75 million people will have cataract-related blindness by 2020. Most will be women, who typically do the cooking and caregiving in the developing world.

With assistance from a member of the ophthalmology staff whom he had trained, Pokhrel administered questionnaires to the two groups of patients to explore a variety of possible environmental hazards, ranging from working in the sun to smoking. (He found that most respondents didn't smoke.)

The survey sought to ascertain the kind of fuel the women cooked with ("dirty" solid fuel or "clean" fuel like liquified propane or electricity), their level of literacy, the location of their homes (rural or urban), the location of their kitchens, and the amount of ventilation available when they were cooking, among other factors.

Pokhrel's analysis revealed that women who cooked with "dirty" fuel were twice as likely to develop cataracts as those who used "clean" fuels. Women who couldn't read or write (an indication of poorer socioeconomic level) were at twice the risk compared to those who were literate. Women from rural areas (generally poor) were at three times the risk compared to those from urban surroundings. Women whose kitchens were partially ventilated were at more than twice the risk compared to those whose kitchens were fully ventilated. Interestingly, having adequate ventilation was not always a matter of economic status but could instead involve cultural predilections about the best location for the family hearth, Pokhrel learned.

Photo by Amod Pokhrel

Pokhrel's study found that women who use solid fuels for cooking, prepare food in poorly ventilated cooking areas, and live in a rural location are at significant risk for developing cataracts.

Reducing Risks

Pokhrel's findings indicate that surgery may not be the only or the best way for developing countries

CATARACTS *continued on page 2*

CATARACTS *from cover.*
to attack cataract blindness.

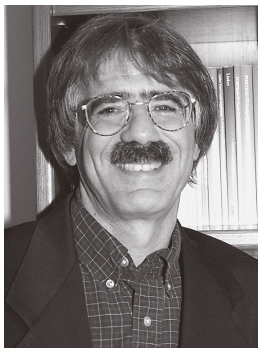
"The cost of cataract surgery at the hospital is 2,400 Nepalese rupees—about $30. That's expensive, and occurs well after the person's sight has been affected," he said. "Mass producing new clean stoves and promoting animal dung-based biogas would cost less. Introducing cleaner fuel and better ventilation would reduce the risk not only of cataract blindness but also of several other respiratory diseases and cancer, yielding a better health benefit and better economics."

Pokhrel has submitted a report of his findings to a September conference on environmental epidemiology, and is refining his analyses in preparation for completing his master's dissertation, which will be based on his cataract research. His thesis adviser, COEH faculty member Kirk R. Smith, director of HED and professor of environmental health at UC Berkeley, was also the adviser for the cataract study.

The COEH Student Project Award is given annually to foster multi-disciplinary student work in occupational and environmental health. Graduate students Jessica Jerald and Morten Schei of UC Berkeley worked with Pokhrel to design the study. Senior Researcher Michael Bates and Environmental Epidemiologist Asheena Khalakdina of the School of Public Health are helping to refine the work.

Pokhrel plans to continue his work on reducing cataract risks. He hopes to create an awareness campaign that will inform the community surrounding the Lumbini Rana-Ambika Eye Hospital about low-cost ways to reduce these risks.

Nicas Named AIHA Fellow


Mark Nicas

COEH researcher Mark Nicas has been named a Fellow of the American Industrial Hygiene Association (AIHA) for "significant contributions to the field of industrial hygiene."

An expert in environmental exposure and risk assessment through mathematical modeling, Nicas, adjunct associate professor in the School of Public Health at UC Berkeley, has been honored for his efforts to protect employees' health, improve the work environment, and advance the quality of the profession.

Only five percent of the AIHA membership can qualify for the Fellow Award.

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Proposed Centers to Expand Breast Cancer Research

Following a landmark report calling for more research to understand and prevent breast cancer, the federal government is planning to establish three new centers for breast cancer studies.

UC San Francisco has submitted a proposal to become one of the centers. A selection is expected at the end of the year.

The proposed Centers for Studies of Breast Cancer and the Environment are part of a research initiative supported by recommendations developed at last year's International Summit on Breast Cancer and the Environment. The Summit, organized by COEH faculty member Patricia Buffler of UC Berkeley's School of Public Health, involved researchers worldwide, public health officials, and a broad range of community groups.

The conference report, submitted in March 2003 to the Centers for Disease Control and Prevention (CDC) and the National Institute of Environmental Health Sciences (NIEHS), called for new research to explore the non-genetic causes of breast cancer, including risk factors at key stages of a woman's life, such as the onset of puberty, pregnancy, and menopause.

The incidence of breast cancer has increased over the past several decades, and some figures indicate that fewer than half of all cases in the U.S. can be explained by known risk factors, such as reproductive patterns and genetic traits.

Research Focus

According to Buffler, the new centers, to be established by NIEHS in collaboration with the National Cancer Institute, will support basic research to understand the structure of the breast and the maturation of breast tissue at the biological level, studies of adolescence and breast development, and community outreach and education.

Explaining the focus of the proposed centers, Buffler said, "It may be that some important exposures putting women at risk of breast cancer may occur very early in life—pre-puberty. Understanding the biological structure of the breast could provide some clues to that. We know that the earlier the onset of menses, the higher the lifetime risk of breast cancer a woman may have, just as a late age of menopause would also be associated with a higher risk of breast cancer. Both those observations are apparently explained by the amount of estrogen a woman produces during her lifetime. A number of epidemiological observations point to this same mechanism. For example, the more physically active young women are, the later the age of menarche. Physical activity in general is associated with a lower risk of breast cancer. Heavier women have a higher risk of breast cancer, particularly after menopause. Unfortunately the proportion of the U.S. population that is overweight has increased rapidly during the last 10 years. Whatever is modifying estrogen production—whether it is physical activity, body mass, or caloric balance (intake vs. output)—is associated with a higher risk of breast cancer."

Buffler, who brought a wide range of groups together for the Summit, is pleased that community outreach and education will be integral to the program of the proposed breast cancer research centers.

"The community is impacted by the disease and the exposures that might be related to the disease," she said. "People in the community may have information that will help the investigators do a better job of designing the research. It is important to involve the community in the development and review of the plans and the dissemination of the findings."

Buffler is professor of epidemiology and the former dean of UC Berkeley's School of Public Health. She and her colleagues at UC Berkeley will support researchers at UC San Francisco, if UC San Francisco is selected as one of the new breast cancer research centers.

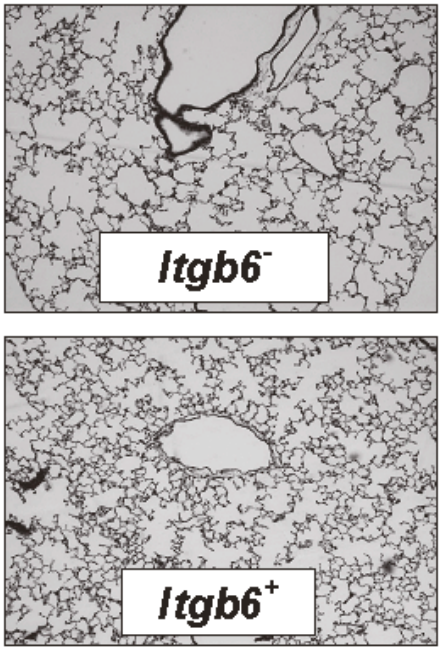
The report on the International Summit on Breast Cancer and the Environment can be viewed at coeh.berkeley.edu.

Photo by Cristophe Genty

Dr. Kenneth Chu of NCI, center, and summit organizer Patricia Buffler, second from right, confer with participants.

Scientists Find Emphysema Pathway in Mice

Scientists in COEH's Lung Biology Laboratory at UC San Francisco have identified a cellular pathway that can cause or stop the development of emphysema in the lungs of mice.



The top picture shows enlargement of alveolar airspaces in the lungs of 14-month-old mice deficient in the b6 integrin subunit (marked Itgb6-). The bottom picture shows lungs of normal mice (Itgb6+). Such alveolar enlargement over time is a defining feature of pulmonary emphysema.

Their findings may help point to genetic factors that explain why some people get emphysema while others are protected.

"When the lung is exposed to injurious stimuli from smoking, the workplace or the environment, one of the first responses is for cells called macrophages to be turned on," explained Laboratory Director Dean Sheppard. "Macrophages clean debris from the lungs. They are a key to defending the body from injurious stimuli, but they have to be tightly balanced and controlled or their clean-up work can go too far and damage the lungs. The pathway we've described is an important protection, because it shuts off the clean-up activity, before it leads to emphysema."

Too Much Mmp12

Some years ago, Sheppard and colleagues, using mice that they had changed genetically to lack a single cell-surface protein, αvβ6, discovered that a major function of that protein is to activate another protein called TGF-β. Following up on that finding, lab researchers headed by Assistant Professor David Morris recently looked at genes in two lines of mice—one that had αvβ6 and the other that didn't. They found that Mmp12—a gene that plays a role in the breakdown of lung tissue and the development of emphysema—was abundant in the lungs of the mice that didn't have αvβ6. Mmp12 is made by macrophages. In mice without αvβ6, the macrophages got activated but didn't get turned off, overproducing Mmp12 and causing harm to the lungs. Morris, Sheppard, and colleagues concluded that αvβ6 plays a key role in turning the macrophages off, thus controlling production of Mmp12.

Further research corroborated that conclusion. As the mice without αvβ6 got old, they progressively developed emphysema. The researchers reversed this process by putting αvβ6 back into a small number of epithelial cells. All it took was reintroducing αvβ6 into a small number of cells to keep the Mmp12 in check. In another experiment, the team generated mice that could be induced by drug treatment to make active TGF-β in the lungs. Producing TGF-β in the lungs also stopped the mice from developing emphysema.

"One or more of the molecules in this pathway may help to explain why only a fraction of people who smoke—one of eight—get emphysema," Sheppard said. "The strong suggestion is that one or more of the steps in this pathway, involving αvβ6, TGF-β, and the way the macrophages respond to TGF-β, might well contribute to the difference in people's susceptibility to the disease."

Identifying Genes

Drawing upon their findings with genetically altered mice, the UC San Francisco researchers are working with scientists at Harvard University to identify genes that might make people susceptible to emphysema.

"It's important for people to know that they are susceptible so that they can make appropriate occupational and lifestyle choices," Sheppard said.

Ultimately, Sheppard hopes that understanding the biological mechanisms by which the lung responds—and shuts off its response—to injury will make it possible to develop better ways to fight respiratory diseases.

Reducing Risks for Home Care Workers

COEH's Labor Occupational Health Program (LOHP) at UC Berkeley is working with the National Institute for Occupational Safety and Health (NIOSH) to help protect home care workers from injuries on the job.

In California alone, 200,000 home care workers provide in-home support services to low-income elderly and disabled people. These workers, low-income themselves, primarily female, often immigrants or minorities, face musculoskeletal risks from physically stressful work such as lifting the people for whom they are caring, pushing wheelchairs, and scrubbing floors.

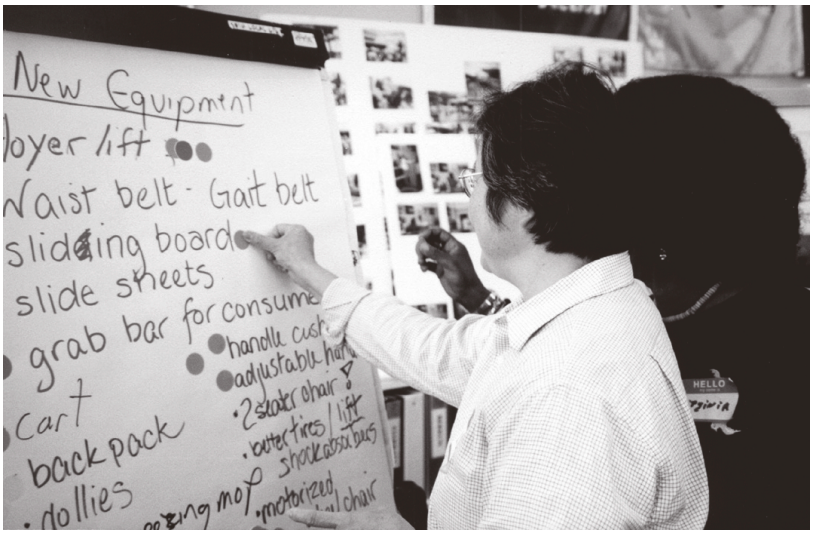


Photo by Laura Stock

LOHP training session for home care workers.

Two-Year Study

A two-year research project has concluded that home care workers are unprepared to protect themselves from safety and health hazards and that poor communication between workers and the people who have hired them increases these hazards. The study found that consumers of home health services are not necessarily skilled at being employers, nor are their homes well equipped for the services they need. Also, contrary to common belief, for some home care workers, the hazards of housekeeping, such as cleaning bathtubs, carrying groceries, or doing laundry, may be as serious as those posed by lifting and transferring tasks, such as moving someone from a bed to a wheelchair.

With NIOSH, the Alameda County Public Authority for In-Home Support Services, and the Service Employees International Union (SEIU), Local 616, which represents home care workers in Alameda County, LOHP has identified the types and causes of most common injuries, associated injuries with home care tasks, and recommended changes. NIOSH is expected to issue a final report this month.

Training Program

In addition, LOHP Associate Director Laura Stock has developed a pilot training program for home care workers to address ergonomic risks. Using Stock's curriculum, LOHP has conducted three training sessions, in English, Spanish, and Chinese, focused on ergonomics, communication skills, and strategies for preventing injuries.

"Each session addressed how to make change, using solutions that participants had identified. We looked at changes you can make yourself, like using better body mechanics, changes you can make with your consumer's help, like asking for a new mop with a longer handle, and systemic changes that require outside support, like better training and access to resources for all home care workers," Stock said.

LOHP received support for the home care worker pilot training project from the UC Institute for Labor and Employment. Professor Meredith Minkler of UC Berkeley's School of Public Health sponsored the project. LOHP is seeking additional funding to refine the pilot curriculum and develop more extensive "train the trainer" programs that will reach many more home care workers.

"Given the dire economic picture, finding support for programs to improve conditions for home care workers will be challenging," Stock said, "but some strategies don't cost much and will be good for both the home health workers and consumers—like improving communication. Fewer worker injuries will mean less turnover and improved quality of care."

COEH

Located on the Berkeley, San Francisco, and Davis campuses of the University of California, COEH trains occupational and environmental health specialists in medicine, nursing, toxicology, epidemiology, ergonomics, and occupational hygiene. It also conducts research and facilitates exchange of information and experience among labor, industry, and the academic community to better serve the working population. In 1982, it was designated an Education and Research Center (ERC) of the National Institute for Occupational Safety and Health (NIOSH). COEH *Bridges* is published quarterly and is available at no charge.

Director
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Program Directors
Robert C. Spear, Robin L. Baker, Julia Faucett, Marc B. Schenker, John Miles, S. Katharine Hammond, Kirk R. Smith, David Rempel

Suzanne Llewellyn
Managing Editor

Rachel Efron
Production Manager

Vivian Auslander Communications
Editorial Services

Dennis McKee Design

Phone: 510/643-4421
Fax: 510/642-5815

http://coeh.berkeley.edu
E-mail: rmefron@uclink.berkeley.edu

Trellis Height Influences MSD Risks in Vineyards, Study Finds

Photo by Fadi Fathallah

A worker simulates vineyard pruning as instruments record his motions.

A study of five different trellises used in California vineyards has shown that one trellis—the popular VSP (vertical shoot positioning)—protects workers best against developing musculoskeletal disorders (MSD) of the wrist and lower back while pruning.

COEH faculty member Fadi Fathallah and Andrew Kato, then a graduate student in the Agricultural Ergonomics Research Center at UC Davis, evaluated five trellis systems commonly used in the Napa and Sonoma Valleys to learn which, if any, would minimize MSD risk factors such as repetitive forceful hand and shoulder motion, sustained forward bending, overextension, and other awkward body postures.

In the first study ever to quantitatively measure trunk posture and wrist motion during simulated pruning activities, Kato and Fathallah tracked the movements of skilled vineyard workers as they pruned actual branches embedded in foam at heights where the branches would be cut during actual pruning.

The workers wore a Motion Analysis System, which captured information about wrist motion, and a Lumbar Motion Monitor that tracked their body motion on three planes, including forward bending. They pruned branches attached to five standard trellis systems that ranged in height from two- to four-feet off the ground. In addition to measuring the workers' wrist and trunk movement, Fathallah and Kato asked them to rank the trellis systems for bodily discomfort. Their subjective response—a clear preference for the VSP system—corroborated the quantitative findings.

Workers in California's burgeoning wine industry suffer from a high incidence of work-related MSDs—80 reported incidences per 1,000 workers. The most common and most costly injuries involve the lower back and upper extremities. Pruning requires long periods of physically demanding, highly repetitive work. With a grant from the National Institute for Occupational Safety and Health (NIOSH), Fathallah and Kato undertook their research to help the industry select trellis systems that might improve worker health.

"Height dictates the difference in risk levels and comfort," Fathallah said. "We found that only a few inches can be significant. It's tricky, because of the small difference, and it's hard to pick up visually, which is why gathering quantitative data is so important. You might think intuitively that the highest system would work best, because it requires the least bending, but our quantitative results showed that the workers were extending their back while pruning branches using the highest system, which isn't good either. They corroborated these findings by telling us that they were most uncomfortable with the systems at the extreme—the very lowest and the very highest."

VSP System

At a height of 42 inches, the VSP system required the least bending or extension of the left wrist and the least forward bending, helping workers maintain an upright, neutral body position to a greater extent than the other systems.

"It is fortunate that the VSP is the most widely used system in the Napa and Sonoma Valleys," said Fathallah, who hopes to get the word out to the industry that, when the time comes to replant old vineyards, using the VSP is a good choice for worker health and safety.

Other COEH faculty and academic staff members involved in this project included John Miles, Julia Faucett, Jim Meyers, and Ira Janowitz.

Fathallah and his graduate students are continuing to work on agricultural ergonomics, with a focus on the biomechanics of back injuries. They are currently analyzing data on harvesting grape clusters and will be reporting their findings soon.

NIOSH Training Grant

Fathallah not only conducts ergonomic research in agriculture, he is also dedicated to improving the methodology and the instrumentation available for ergonomic research. With support from a NIOSH Pilot Research Training Award for young investigators, he recently completed a study to assess the accuracy of a newly developed, commercially available portable device for measuring forward bending in the workplace. The study showed that the device, BackTalk, could be a useful research tool for quantifying the frequency and level of bending among industrial workers; however, Fathallah found that the device does not give accurate readings in situations where the worker is moving very fast or making moves involving small (15 degree) angles.

Hubbard: Accounting for Uncertainty

Biostatistician Alan Hubbard, COEH's newest faculty member, plays a critical role in occupational and environmental health research. Hubbard collaborates with colleagues in a variety of scientific and engineering disciplines to help assure that they are interpreting their information as accurately as possible and drawing fair conclusions from their work.

An assistant adjunct professor in the School of Public Health at UC Berkeley, Hubbard brings sophisticated mathematical tools to epidemiological and biological studies. He uses these tools to help his colleagues design their research as precisely as possible, interpret the patterns they may find, and account for variability and unknowns in their data.

"When you are looking at environmental exposures in an urban area, for example, you can't measure all the risks, and you are dealing with people, so you have lots of variables," Hubbard said. "You might be interested in risk factors for indoor air pollution in a situation where poverty or access to medical care may affect your findings. One of my interests is in dealing with large, complicated data sets and accounting for sources of uncertainty."

Research

Hubbard is working with COEH faculty member Robert Spear of Berkeley's School of Public Health and an international research team to monitor, predict, and, eventually, prevent the transmission of schistosomiasis, a parasitic disease with a complex snail-human transmission cycle that infects nearly a million people in rural China. The team is using mathematical models to learn the best way to use scarce resources to break the cycle that re-infects people.

With another research team headed by COEH faculty member Martyn Smith of UC Berkeley's School of Public Health, Hubbard is seeking to understand the cellular mechanism by which exposure to benzene leads to cancer. The association between benzene and cancer is well established epidemiologically. Smith's team is exposing cells to benzene and studying what Hubbard calls "genetic screw-ups" that may corroborate the epidemiological association. Hubbard is helping the team to understand the dose-response pattern of the benzene exposure, asking whether the pattern is statistically significant and determining the nature of the pattern.

Hubbard joined the faculty of the School of Public Health after earning his doctorate in biostatistics at UC Berkeley in 1998. He has published widely in his field, and teaches graduate courses in causal inference, longitudinal data collection, and computational biology.

Alan Hubbard

Arsenic Study Honored

Sara Ash, a 2003 graduate of UC Berkeley's School of Public Health, has won first place and a $1,500 scholarship in this year's Semiconductor Environmental Safety and Health Association (SESHA) national competition for her paper presenting an evaluation of arsenic exposure and methods for reducing arsenic exposure risks in the semiconductor industry. Ash, who just received her MPH with a focus on industrial hygiene under COEH faculty member Katharine Hammond, is particularly interested in exposure monitoring.

Photo by Janny Chiu

Sara Ash

Health Policy Symposium

Nearly 90 public and environmental health practitioners attended COEH's April symposium on environmental and occupational health policy and heard from speakers addressing the extent to which environmental and occupational health policy approaches have resulted in shifting health risk between environmental media, geographic regions, or populations of people rather than in genuinely reducing health risk. For a summary of the symposium, please visit http://coeh.berkeley.edu/News/news.htm.

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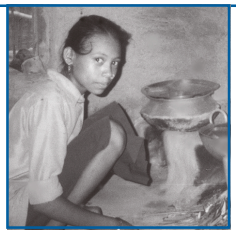

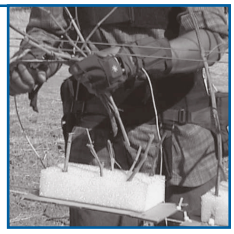

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University of California
CENTER FOR OCCUPATIONAL & ENVIRONMENTAL HEALTH
School of Public Health
Berkeley, CA 94720-7360

http://coeh.berkeley.edu

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