Workplace Exposure Linked to Severe Respiratory Disease

by Wallace Ravven

Workplace exposure to dust or fumes may account for as many as five million cases of emphysema, chronic bronchitis and related diseases in the US: diseases that have been mainly attributed to smoking, a new survey (by COEH researchers at UC San Francisco) shows.

While smoking still accounts for most of the 16 million cases of chronic obstructive pulmonary disease, or COPD, the finding that occupational exposure may contribute to the illness in three to five million people strongly suggests a need for better workplace prevention, the researchers say.

COPD involves chronic lung inflammation, a narrowing of the airways and increasingly severe breathing difficulties. It is the fourth-highest cause of death in the US, killing more than 100,000 people a year. Worldwide, COPD kills three million people every year and is expected to become the third-most-common cause of death within 15 years. Annual direct and indirect costs of the disease in the US have been estimated at more than $30 billion, according to statistics from the National Institutes of Health.

“Although smoking prevention remains paramount, controlling hazardous exposures can also have an important role in reducing COPD,” said (COEH faculty member) Paul Blanc, senior author of the study.

The study found that chronic bronchitis, emphysema and related diseases are twice as frequent in people who have been exposed to toxic airborne substances in the workplace, regardless of whether or not they smoke. Workplace exposure has long been suspected in the disease, but no definitive studies have been carried out to quantify the proportion of cases contributed by the workplace.

Researchers interviewed more than 2,000 people in the US, aged 55 to 75, by telephone, asking them about their respiratory health and their work histories. Subjects were randomly selected from all over the nation. The 55-75 age group represents the peak incidence of COPD.

More than half of the people with COPD reported that they had been exposed to airborne toxins in the workplace, while only one in three of those free of respiratory disease reported such exposure. Analysis of the results showed that exposure to various workplace toxins doubles the risk of COPD, and that workplace exposure is a contributing cause of 20 to 31 percent of the diagnosed COPD cases.

Less than 20 percent of those suffering from COPD were still working — half the percentage of those without COPD — underscoring the physical and financial toll of the disease.

“Given the severe impact of COPD, it is critical to identify all possible avenues of exposure,” said Laura Trupin, epidemiologist in UC San Francisco’s Department of Medicine and lead author on the study. “These findings direct us to look beyond the cigarette when we consider prevention of chronic lung disease.”

While smoking remains the predominant cause of COPD, the study’s authors conclude that “the workplace environment plays an important role too. Clinicians and public health policymakers must also take workplace conditions into account when establishing preventive strategies.”

The team focused on each subject’s longest period of workplace exposure to vapors, gases, dusts or fumes. In addition to the information provided by the respondents on what they may have inhaled, the scientists relied on data from the European Community Respiratory Health Survey, which identifies the degree of exposure to toxic substances for each type of job.

Vapors, gases and smoke released by the combustion of various materials were associated mainly with blast-furnaces and foundries, work with diesel engines and workplace exposure continued on page 2.
The first study to follow the injury experience of migrant farm workers through a whole growing season has found that women who are paid for their labor on a piece-rate basis (based on the amount of produce they bring in) face a much greater risk of injury on the job than those paid by the hour.

The study, headed by COEH faculty member Steve McCurdy of the Department of Epidemiology and Preventive Medicine at UC Davis, surveyed Hispanic agricultural workers living in six Northern California Migrant Family Housing Centers during the 1997 harvest season.

“This study showed it is possible to follow migrant farm workers through time to learn about their risk of injury—that has never been done before,” McCurdy said. “We found that the injury occurrence in this group was comparable to that of agricultural workers in other U.S. settings—farmers, for example. That was a surprise to me, but that’s why we do research!”

More than 800 study participants answered a series of questionnaires throughout the harvest season.

About half were women. Known in the industry as “shuttle” migrants, these workers typically come to the Sacramento area for the six month harvest season and then return to their homes, predominantly in Mexico. They have families, arrange for work and housing a year in advance, and are generally non-smokers who are healthy enough to withstand the rigors of their labor, according to McCurdy. The main crop the workers were harvesting was tomatoes, and their most common tasks were hoeing, manual harvesting, and selecting produce.

Study participants reported 86 injuries associated with agricultural work, the most common of which were strains and sprains. While this rate of injury (approximately 10 percent) is high compared to other occupations, it is in line with other findings for agriculture, McCurdy said.

McCurdy and his research team had hypothesized that workers paid piece-rate would have a higher injury rate than those paid by the hour, since piece-rate workers might sacrifice safety for speed. In contrast, hourly workers would not have the same incentive to work faster.

The study documented an approximate five-fold increased risk among piece-rate workers compared to hourly workers. This effect did not seem to be explained by differences in tasks between these two groups, and the increased risk held true only for women.

“Why this difference should only be seen among women is still a mystery to me,” McCurdy said. “I’ve conducted focus groups with farm workers since then to get a sense of what might underlie that finding, and nothing has come up, so we need to do more research. If future research confirms this finding, there are important policy implications. We should question whether it is appropriate to use piece-rate payment schemes, because piece-rate payment may exacerbate musculoskeletal overuse.”

McCurdy’s team also found that the risk of injury was greater among smokers, which “suggests that doing smoking cessation in the workplace may translate to lower injury risk,” he said.

Other members of the UC Davis research team included Steven Samuels, Daniel Carroll, James Beaumont, and Lynne Morrin. The study was funded by the National Institute for Occupational Safety and Health (NIOSH).
Marion Gillen, associate professor of nursing at UC San Francisco, has been named director of COEH’s Occupational and Environmental Health Nursing (OEHN) program.

Gillen, a seven-year veteran of the program, takes the helm from Julia Faucett, who has become chair of the Department of Community Health Systems (DCHS) at UC San Francisco. The OEHN program is part of DCHS.

“Marion is a highly respected member of the occupational and environmental nursing community here in California and throughout the country,” Faucett said. “Her research on health care workers and construction workers has improved our understanding of health and safety issues in those professions. She is a superb teacher who consistently wins praise from her students, and she is highly respected as a trusted and talented collaborator.”

Gillen received her BSN from Rutgers University, her MPH from Johns Hopkins, and her PhD in occupational health nursing from UC San Francisco. She joined the UC San Francisco faculty in 1996, with experience in nursing, health care administration, education, and research.

She sees her biggest challenge in her new role as “keeping up recruitment in challenging economic times, and seeking new ways to encourage nurses to consider OEHN as a specialty.”

In Faucett’s new role, she oversees primary care training for nurse practitioners, psychiatric mental health and community-based care systems, in addition to the OEHN program. She continues to be an active member of COEH and a contributing member of OEHN. She and Gillen share responsibilities for the program’s doctoral research seminar. Faucett considers that one of the greatest challenges in her new role is to respond to the nursing shortage and needs for leaders and faculty in community health nursing by attracting students to the department’s graduate programs.

Harrison Named to Standards Board

Skylight safety, protection for tree trimmers, smoking bans. These are just some of the many issues that COEH faculty member Robert Harrison is considering, now that he has been appointed to the Occupational Safety and Health Standards Board (OSHSB) of California’s Department of Industrial Relations (DIR).

OSHSB sets standards within the Cal/OSHA program. The objective of the seven-member board is to “adopt reasonable and enforceable standards at least as effective as federal standards.” The board also maintains standards in areas not covered by federal regulations, such as elevators, aerial passenger tramways, amusement rides, and pressure vessels.

Harrison, who holds a joint appointment as clinical professor of medicine at UC San Francisco and chief of the Occupational Health Surveillance and Evaluation Program for the California Department of Health Services (DHS), is the occupational health representative on the board.

Other members represent labor, management, safety and the general public.

Since joining the board several months ago, Harrison has helped to promulgate standards to protect workers in high-risk occupations and to reduce health risks for the general public.

“For example, we’ve adopted an emergency standard for enforcing a ban on smoking in enclosed spaces, like bars and restaurants,” he said, “and we’ve modified regulations for fall protection among tree trimmers and roofers.”

As the only physician among the seven board members, Harrison brings to OSHSB not only a commitment to but also extensive experience with diagnosing and preventing work-related illnesses and injuries. Among his areas of expertise are toxic exposures and musculoskeletal disorders—knowledge that should prove to be very valuable, since the board is currently considering standards for chemical exposures and workplace ergonomics.
New Partnership to Improve Agricultural Health and Safety

COEH is joining with the Occupational Health Branch (OHB) of the California Department of Health Services and Cal/OSHA of the Department of Industrial Relations to address health and safety problems in California’s agricultural workforce. The new partnership is the result of several years of planning during which COEH has re-examined and refined its research priorities. In 2004, we plan to involve agricultural stakeholders in a fact-finding process leading to new intervention strategies and policy improvements. We are pleased to be collaborating with government experts in this effort.

Background

California’s agricultural workforce has long suffered from an excessive incidence of workplace injuries and illnesses, leading Cal/OSHA to identify it as a “targeted industry” for enforcement efforts. Agricultural workers have been underserved for a number of reasons, including one now becoming characteristic of other segments of the California workforce, namely, the lack of a long-term relationship with a single employer. Work in agriculture remains sporadic and low paying. Workers, largely immigrants, do not receive the benefits that employers have traditionally provided, such as access to health care and effective health and safety programs. In addition, workers hesitate to act as advocates for their own safety, due to language barriers and fear of jeopardizing their jobs. The goal of our university-government partnership is to better understand the characteristics of this workforce and industry so that we can develop more effective intervention strategies and better policies for protecting workers’ health and safety.

Fact Finding

We will ask the stakeholders we identify from government, industry, labor, academia, and the community to contribute to the fact finding process, help us to identify gaps in our knowledge, and work with us to develop interventions that prevent injury and illness. We will seek to achieve the following objectives:

- Identify the nature and costs of accidents and adverse health outcomes in California agriculture
- Characterize health and safety prevention programs that work and determine the strength of the evidence supporting the importance of the various program elements
- Identify incentives that would motivate California employers to implement prevention programs, and evaluate why some employers respond positively and others do not. Identify policy or other changes that would substantially increase employer participation
- Identify the characteristics that might make it more difficult to implement prevention programs in California agriculture than in other sectors of the economy, and consider what policy initiatives would be needed to deal with these special characteristics
- Identify promising avenues for research that could lead to solutions
- Recommend strategies for improving health and safety conditions in agriculture

As we begin our new partnership, I invite your comments and participation.

John R. Balmes, M.D., Director
A study of more than 1,000 Hispanic women receiving prenatal care in a Stockton clinic has revealed that U.S. born, first generation women who do not work in agriculture are far more likely to put their health at risk with activities like smoking than are recent immigrants working in agriculture.

“Our study covered a spectrum of women: those who had been here for less than a year and those who had been here for awhile, all the way to those who were first generation born here,” said Marc Schenker, COEH program director at UC Davis, who headed the research team. “We were seeking an explanation for why Mexican women who have been in this country for a longer time have higher rates of pre-term and low birth weight deliveries than those who have just arrived. We didn’t find a clear answer to that, because the rate of pre-term and low-birth rate deliveries among the study participants was very low—which was good. What we did find, unexpectedly, was that the longer the women were in this country, the more they engaged in behavior that put their health at risk.”

The adverse health behaviors included unhealthy nutritional choices, smoking, alcohol intake, drug use, and riskier sexual activity.

“We observed a dramatic change for the worse in the health behavior,” Schenker said. “For example, the rate of cigarette smoking was four times greater among women born in the U.S. than among those born in Mexico, and we found illegal drug use among the U.S. born women but virtually none among women born in Mexico.”

The same phenomenon held for alcohol intake during pregnancy, Schenker said. Among the first-generation U.S. born women, 45 percent reported drinking alcohol during pregnancy, while, among those born in Mexico, 10 percent.

“What was really striking to me was the magnitude of the association of immigration and adverse health behaviors—a worsening seriously of the health behaviors with time in the U.S.,” Schenker said.

Measures of acculturation, such as English proficiency, independently corroborated these results. Acculturation was the strongest predictor of adverse health behaviors. Women who were more acculturated were more likely to smoke cigarettes, for example.

Schenker, who has a longstanding interest in agricultural health, considers these findings to be so significant in terms of the impact on the health of an enormous segment of California’s population that he is refocusing his research agenda to address the questions that the findings have raised.

“More work needs to be done to understand why this change occurs and how to prevent a healthy behavior profile from changing to a worse one,” he said.

He is planning a study that will document immigration, farm work, acculturation and health over time to corroborate the results of the Stockton study and to evaluate changes in health behavior and the reasons for the changes in greater detail.

“The transition out of agricultural work correlates with a deterioration of healthy behavior,” Schenker said. “This issue is hugely important. It speaks to my public health mission to address it.”

The research team for the Stockton study included Research Associate Brenda Elvine-Kreis, graduate students Jeffrey Bethel and Olivia Kasirye, and COEH faculty member Laurel Beckett, all of UC Davis, and Julia Walsh, adjunct professor of public health at UC Berkeley. The National Institute for Environmental Health Sciences (NIEHS) funded the study through the NIOSH National Occupational Research Agenda (NORA) initiative.
Is Heart Rate a Key to Asthma Risk?

A study of the respiratory health of young children in California’s agricultural Salinas Valley has yielded preliminary findings that may help researchers identify infants and toddlers who are potentially more susceptible to environmental exposures that may cause or exacerbate asthma.

COEH faculty member Ira Tager, professor of epidemiology at UC Berkeley, and his colleagues are studying the babies of mothers being treated at six clinics in and around Salinas. Their work is part of a larger study of the impact of pesticide exposure on the health of the children of farm workers being conducted by the Center for the Health Assessment for Mothers and Children of Salinas (CHAMACOS), under the direction of COEH faculty member Brenda Eskenazi, professor of maternal health and epidemiology at UC Berkeley.

As part of the respiratory health study, Tager and Michael Lipsett, associate clinical professor at UC San Francisco, evaluated data on autonomic responsiveness in 100 babies aged 6-12 months. The data were obtained by a team headed by Abbey Alkon, assistant professor in the School of Nursing at UC San Francisco, and W. Thomas Boyce, professor and associate dean in the School of Public Health at UC Berkeley. The autonomic nervous system controls bodily functions that occur automatically, like breathing and heart rate, among other activities.

The researchers found that the resting heart rate of babies who had exhibited asthma-like symptoms varied more than the resting heart rate of the other babies in the study. This heart rate information was of interest to the researchers, because greater variability in the heart rate could be an indication that the parasympathetic part of the autonomic nervous system is more reactive than normal. It is the parasympathetic nervous system that reacts to noxious stimuli and makes the airways of the lungs constrict. When constriction gets bad enough, people with asthma wheeze or feel short of breath.

“We know that the airways of children with asthma are more sensitive and react differently to environmental disturbances than the airways of children who don’t have asthma,” Tager said. “The children in the protocol who came from homes with a family history of asthma had more parasympathetic reactivity than those who had no family history of asthma, so we have two pieces of evidence that are consistent with each other. That suggests to us that, very early in life, there may be a difference in the responsiveness of this part of the nervous system that plays a dominant role in the neurological control of the airways in the normal lung. We need to do much more work to corroborate these very preliminary findings. If the results hold up when we assess more children, we may have found a new window for identifying children early in life who are potentially at risk for asthma.”

The CHAMACOS team will continue to follow this first group of children and will assess others as they are born. Ultimately, the team hopes to evaluate the findings relative to the information...
COEH Alumna Named Occupational Health Branch Chief

After a decade as California’s point person for preventing lead poisoning in the workplace, COEH affiliate Barbara Materna now has statewide responsibility for occupational health problems ranging from asthma to silicosis.

As the new chief of the Occupational Health Branch (OHB) of California’s Department of Health Services (DHS), Materna and her staff of 550 perform surveillance and hazard evaluation, and provide interventions, education and technical assistance to prevent occupational disease and injury among California workers. Materna now oversees activities conducted by OHB’s three key programs:

- Hazard Evaluation System and Information Service (HESIS)
- Occupational Health Surveillance and Evaluation Program (OHSEP)
- Occupational Lead Poisoning Prevention Program (OLPPP)

Materna considers a major challenge in her new role to be making people more aware of the importance of occupational health and safety as a public health issue. She would also like people to know more about the services that OHB can provide.

“There is often a sense that enforcement through Cal/OSHA is the entire field,” she said, “but there is also a role for promoting health and safety by identifying important issues, collaborating to find solutions, and disseminating these fixes. California is huge. There are many employers who don’t have access to information and need assistance. Our branch fills that role. For example, our staff has been traveling the state giving seminars to foremen and others responsible for construction safety on how to conduct effective tailgate sessions on construction safety. A lot of people have never been taught how to train. This program helps them become more knowledgeable and gives them tools for involving their crews.”

Materna, who received her PhD from UC Berkeley in environmental health science in 1992, has a personal research interest in intervention effectiveness and construction safety and health. She is collaborating with Marion Gillen, director of COEH’s Occupational and Environmental Health Nursing program at UC San Francisco and Barbara Plog, director of the COEH Continuing Education Program at UC Berkeley, on a study of trench safety.

“I’m excited to be collaborating with the many talented occupational health and safety professionals across California, including my COEH colleagues, and I’m honored to be leading such a group of talented staff who are very committed to bettering the lives of California’s workers,” Materna said.

Chemical Hazards Policy

The European Union is considering a sweeping new policy to address the hazards that chemicals pose to health and the environment. COEH has co-hosted a visit from European experts involved in this effort, known as REACH (Registration, Evaluation, and Authorization of Chemicals), and is following the progress of this initiative. For more information, visit http://coeh.berkeley.edu and click on “News” to see the article by COEH researcher Michael Wilson and former COEH faculty James Cone published by the San Francisco Chronicle.
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