



AgHealth News

From the Western Center for
Agricultural Health and Safety

Summer 2006, Vol. 15 No. 3

University of California, Davis

Central Valley farming town of Parlier focus of particle inhalation research

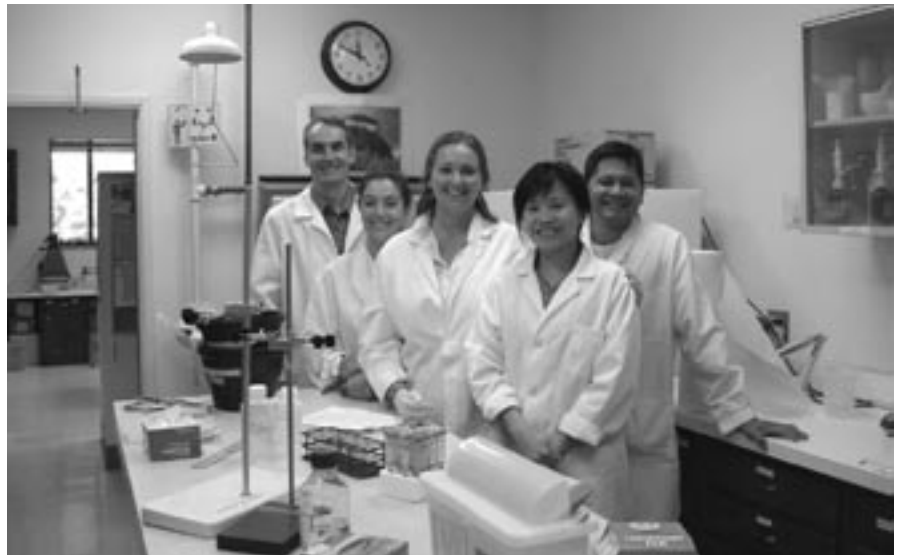
By Kari Fish

The San Joaquin Valley routinely experiences some of the highest airborne particulate matter concentrations in the United States, and with extensive farming practices, towns like Parlier may potentially be “getting more than their fair share of pesticides,” said Kent Pinkerton, associate director for WCAHS and principal investigator for the center’s particle inhalation research in Parlier.

Parlier is a small town of 11,000 people nestled in the Central Valley near Fresno and surrounded on all sides by farming. Ninety-seven percent of the population is Hispanic and nearly all who live there are connected to agriculture; both significant environmental justice factors for the Department of Pesticide Regulation’s (DPR) air monitoring pilot project.

The air monitoring data that DPR collects, and collaborations with the Air Resources Board, the San Joaquin Valley Air Pollution Control District, UC Davis and University of Southern California engineers can be great supplemental information for the study, said Pinkerton. They will be able to provide information on air particle characterization, concentrations and chemical speciation during the center’s pilot study.

Pinkerton and his colleagues are
(see **Parlier** on page 2)



Kent Pinkerton (back left), PI for the center’s particle inhalation research in Parlier, with Christine Haas, Laurie Hopkins, Mai Ngo and Julian Recendez.

Reaching out in the agricultural community

Since its inception in 1990, the Western Center for Agricultural Health and Safety (WCAHS) has engaged in many ongoing projects that provide information and education opportunities for people involved with agricultural health and safety issues. Our dissemination network consists of a very active and dynamic Web site, list server, newsletters, conferences, workshops and educational seminars.

Historically, the center’s outreach and training efforts were driven by Patrick O’Connor-Marer’s highly successful Pesticide Safety Education Program (PSEP). O’Connor-Marer was recognized for his state-approved train-the-trainer programs that provided the center with a wonderful relationship with the UC Integrated Pest Management Program that lasted for 14 years. When O’Connor-Marer retired in 2004, continuation of pesticide safety training was necessary, but due to unavailability of new funding, including WCAHS core funding, PSEP was phased out of the statewide UC IPM program. This left a hole for the center’s safety education

(see **Outreach** on back page)

Parlier from page 1

in the process of conducting inhalation experiments on healthy rats to examine the respiratory effects of exposure to fine, ultra-fine and coarse particles present in the ambient air. Pinkerton's lab will analyze the potential respiratory effects of ambient air particles, composed of nitrates, organics and carbonaceous compounds, which may be generated by crop production, field preparation as well as dairy and herd operations. Studies in Davis and Fresno have shown that coarse particles (2.5 to 10 micrometers) can cause acute lung injury. According to Pinkerton, certain chemicals in the coarse particles, such as crystalline silica, a hazardous substance, can be dangerous. However, fine particles (<2.5 micrometers) can actually harm cells, though researchers are still uncertain of "what" is doing the damage.

Investigators conducted inhalation experiments in June in a mobile trailer, equipped with exposure chambers, provided by the UC Davis College of Engineering. They completed two exposure trials of rats to one of three treatments: filtered air without particulate matter (PM), concentrated ambient air containing only fine or ultrafine particles, or concentrated ambient air containing only coarse particles. They were exposed to the respective treatments for six hours per day, for three consecutive days.

They used a virtual impactor system to create the fine and ultrafine air particles, which takes the ambient air and puts it through a water bath, humidifies the particles, cools them, removes the air and then dries the particles so that they end up with a high concentration of PM. The coarse particles are created by acceleration through the virtual

impactor in a manner which fails to concentrate fine and ultrafine particles.

After exposing the rats to their respective treatments, investigators analyzed the air's effects on the lungs, nose, olfactory bulb and brain.



A week after assisting in the Parlier study, Christine Haas competed in the state high school rodeo finals.

During the second trial of the experiment, investigators were fortunate to work with a local budding young scientist, Christine Haas, a recent graduate of East Clovis High School. Haas will enter UC Davis in the fall as a biochemistry and molecular biology major and one of this year's Regents Scholars. She has been conducting research of her own for the past seven years on mosquito abatement with natural toxins. In the ninth grade, she won first place in the California State Science Fair as well as the Discovery Channel's Young Scientist Challenge for her ongoing research project.

Haas was drawn to Pinkerton's research in Parlier due to her interest in conducting veterinary research. She would like to test the safety of her natural mosquito toxin on animals, by using laboratory rats. After completing her undergraduate degree,

she plans to attend the veterinary research program at UC Davis.

"It was a wonderful experience," said Haas of her time working in Pinkerton's lab.

Now, WCAHS researchers are in the midst of analyzing the effects of each of the treatments on the rats. In particular, they are checking for cytokines—signaling molecules that indicate evidence of inflammatory response—in blood and lung lavage samples. They are also analyzing cells lining the airways of the lungs. The presence of certain cell types can indicate if damage has occurred. In addition, they are conducting biochemical assays to look for signaling molecules in the lungs, and examining the structure of the lungs.

Investigators will also look at the olfactory bulb, the brain center for the detection of smell, for signs of oxidative stress and inflammatory response. "By the end of the summer we hope to have a fairly good interpretation of the results," said Hopkins.

The coarse particle treatment is expected to pose no real health problems, since the particles are large enough to be trapped in the upper respiratory system and cleared out, said Hopkins, though they may find some dust in the lungs and possibly some changes in the levels of mucous lining the airways, she added. In contrast, fine and ultrafine particles can get deep down into the lungs and cause damage. Hopkins suspects there may be some degree of inflammatory response, some histological damage and possibly some immune response in the rats. In terms of nasal cavity response, she is uncertain what she will find. "We may see subtle changes or a state of exaggerated normal," she said.

Hopkins and Mai Ngo, a postdoc

Continued on page 3

Heat stress focus of outreach education in Mendota

The MICASA (Mexican Immigration to California: Agricultural Safety and Acculturation) community-based study of farm worker families living in Mendota is a high priority for the outreach and education efforts of the Western Center for Agricultural Health and Safety. As summer temperatures in the Central Valley reach as high as 116 degrees for several consecutive days, heat-related illnesses increase—especially among farm workers.

While Cal/OSHA works to adopt a permanent heat illness prevention standard (*Title 8, Chapter 4, § 3395, Heat Illness Prevention*), the center's Community Outreach for Research and Education (CORE) group, the MICASA field team, and the local advisory committee are working together on a short-term emergency plan to provide information to farm workers about prevention and dangers of heat stress.

"After a 109-degree day in Mendota, we are all very concerned about the dangers of heat illness. I can't imagine anyone working in the

fields in this temperature, but there they are" says Kathleen O'Connor, MICASA field leader. "We are moving forward with great creativity and terrific collaboration with the local community advisory committee to get the word out there about heat illness," says O'Connor.

Mendota has a large proportion of immigrants from Mexico and Central America and a very high proportion of agricultural workers. Our study population will be selected from 2,441 individuals living in 751 households. Of these, 86 percent are farm workers. The primary language spoken and understood is Spanish. The average literacy level is below a sixth-grade level, so the field team has translated the heat stress field information into colloquial Spanish in short handouts. For example, the colloquial expression for heat stress is "quemarse," to burn oneself.

The MICASA field team has also produced a Spanish-language newsletter, *El Melon Rondero* (the rolling melon), emphasizing "symptoms that must not be ignored" and "what to do" as another means for provid-



ing heat illness information quickly to farm workers and their families. Our next step is to visit the farm employers/managers to work together so we can distribute the handouts at brief lunchtime visits.

The Labor Occupational Health Program at UC Berkeley has invited the Center's CORE group to participate in the first planning committee meeting in August with community organizations and local government to look at different types of educational activities addressing heat stress. This meeting will lay the groundwork to begin developing educational activities around heat stress to reach farm workers, including those who only speak indigenous languages such as Mixtec or Triqueño.

Parlier *continued from page 2*

toral fellow working in the lab, would like to determine what PM does in the nasal cavity and how particles may be transported to the brain and the central nervous system.

In fact, Pinkerton's lab recently submitted a proposal to UCLA to study the connection between inhaled particles and Parkinson's disease, a severe neurological condition associated with extensive destruction of neurons in the brain, and is waiting for a response. If approved, his research team would go back to Parlier for additional studies in late October to early November.

This research could serve as a good comparison to the experiments conducted in June, said Pinkerton, due to different air particle compositions and pesticide levels.

"Even if we find that the air is OK to breathe, the experiment was beneficial because it lets the researchers know what they do not need to focus on and they can redirect their efforts to something else that may be hazardous to health," said Hopkins.

Knowing what it is in the air that produces harmful health effects can help government agencies make policies so regulations can be de-

veloped to protect those affected, said Pinkerton. With the results of the Parlier study, investigators intend to begin public outreach and educational programs on the health effects of agricultural practices in this area.

For more information on this project, please contact Kent Pinkerton at kepinkerton@ucdavis.edu.

Kari Fish is an agricultural health outreach intern and a UC Davis undergraduate student majoring in environmental biology. She may be reached by e-mail at kmfish@ucdavis.edu.

WCAHS welcomes new education and outreach coordinator

Working in the Ag Center brings back a lot of fond childhood memories, said Elizabeth Noceti-DiDio, the new education and outreach specialist for WCAHS. She recalls spending many weekends of her early childhood on her grandparents farm in Linden, California. “Those were my favorite years.”

During an outreach meeting in May at the UC Kearney Agricultural Center in Parlier, Noceti-DiDio discovered a connection with Kearney IPM Advisor Walt Bentley, whose family friendships include her grandparents Richard and Norma Noceti from Linden.

“We all farmed along Comstock Road, fairly close to the Calaveras River, and we grew the same crops—walnuts, cherries and peaches,” said Bentley. “Everything in Linden seemed to revolve around farming at that time, even Farm Bureau meetings were a big thing. We still get together at big events, but [my parents and your grandparents] all move more slowly now.”

Noceti-DiDio joined WCAHS on April 10. Her responsibilities include serving as the liaison between the center and the agricultural community and related organizations; partnering with educators to develop training programs and educational materials; and to assist in developing an evaluation model to look at the impact of training.

Involved in clinical and epidemiological research studies for the past 15 years, Noceti-DiDio most recently served five years as a project manager in the UC Davis Department of Nutrition, working on three major human nutrition studies, developing partnerships, collaborations, and establishing relationships with community based organizations. Under Noceti-



Elizabeth Noceti-DiDio

DiDio’s leadership and direction, she developed an effective program that provided UC Davis undergraduate students at the Ragle Human Nutrition Research Center an internship that was highly sought after and provided an excellent professional experience.

“Your willingness to incorporate undergraduate students as an integral part of your team is key to the success of the program,” said Janice Morand from the UC Internship and Career Center. When I joined WCAHS, one of my goals was to somehow use the same model to develop another successful internship.

Noceti-DiDio is a co-author of three scientific papers and has been acknowledged on others.

Elizabeth has been married for almost a year to Chris DiDio, a GIS specialist in the UC Davis Office of Resource Management and Planning. They have three grown children (DeAnna who is married, Anthony and Justine), and one grandchild, 2-year-old Luke, who is learning Spanish and Italian.

WCAHS investigator wins award

Frank Mitloehner, principal investigator for the WCAHS project: *Respiratory Health Exposures on Large California Dairies*, received the 2006 Academic Federation Award for Excellence in Research for meritorious achievements. Mitloehner, an animal scientist and air quality specialist in the UC Davis Department of Animal Science, is conducting research projects related to livestock production, especially quantification of ammonia, dust and volatile organic gas emissions in dairies, beef feedlots and poultry operations. He won the award for research productivity in the areas of publications, grants and graduate student mentorship. The award recipient is determined annually by the Academic Federation Committee on Research at the University of California, Davis. “I hope that my membership in the Ag Center will help link agricultural and environmental expertise with medical and public health research and outreach,” said Mitloehner. “The combined expertise across Ag Center scientists here at UC Davis is unique in the country. We are cooperatively working together to help protect the health of farm workers and their families through credible research and effective outreach.”



Western Center receives JMIE award for public policy research

The John Muir Institute of the Environment (JMIE) has awarded grants to WCAHS Director Marc Schenker to evaluate the environmental impact of housing conditions among hired farm workers in California, and to Associate Director Kent Pinkerton to investigate nanomaterials and their affects on humans and the environment.

Environmental or workplace exposures among hired farm workers bring pesticides and other farm chemicals into their homes, whether conventional dwellings or shacks. Environmental assessments of farm worker housing in the Salinas Valley found 50 percent of homes had peeling paint, 43 percent had mold, 25 percent had water damage, and 11 percent had rotting wood. Evidence of cockroaches and rodents

was present in 60 percent and 32 percent of homes, respectively. These are at higher rates than U.S. comparison housing.

Children and pregnant women may be at particular risk for exposures to these hazards, but little research has been done on the health outcomes associated with these conditions. Housing conditions may also have an impact on the environment. For example, if dwellings lack proper sanitation facilities, the likelihood of environmental contamination is increased and is of significance to environmental health authorities. Dr. Schenker will be collaborating with Don Villarejo, agriculture policies researcher, to review the environmental impact of current farm worker housing in California and to examine public policy op-

tions at all levels of jurisdiction to develop workable solutions.

Researchers estimate that nanotechnology will become a billion dollar global industry by the year 2010 for manufacturing nanoscale materials, tools and devices. An incredible plethora of companies are already using nanoscale materials in a wide range of products, such as sunscreens, composites, medical devices and chemical catalysts. This large demand and production could lead to unintended exposures of nanoscale to humans and other organisms. Little is known about the fate, transport and transformation of nanosized materials as they enter and move through various ecosystems. The products containing manufactured nanomaterials that are produced, used, recycled, or disposed of could have harmful effects on the ecosystem. Pinkerton and his colleagues will perform a thorough evaluation of the possible uses of nanomaterials in the global market and the potential for these products to enter the environment. Particularly, investigators will gather information about the fate, transport and transformation to estimate the potential for exposure to manufactured nanomaterials in the environment and any risks to human health and the environment.

Established at UC Davis in 1997, the John Muir Institute for the Environment (JMIE) works with federal, state and regional agencies to develop a comprehensive and cross-disciplinary approach to environmental management and problem solving. Solutions are based on ecological, toxicological, economic, societal and regulatory models.

The results of these JMIE-funded studies will be disseminated widely to the scientific, medical and policy making communities.



The WCAHS Executive Advisory Board (EAB) held its June 2nd meeting in The Robert and Margrit Mondavi Center for the Performing Arts on the UC Davis campus. The EAB meets regularly to review projects in progress and discuss future Center direction, including potential new projects. Chosen for their diverse perspectives and expertise, the board members engage in dialogue regarding unique and shared agricultural workplace health and safety issues, as well as intervention successes and challenges. We are fortunate to have Executive Advisory Board members Carol Barney, John Garcia, Paul Gosselin, Charles Hess, Anne Katten, EAB Chair Bill Krycia, Paul Lum, Paul Martin, Bruce Mayeda, Steven Nation, Robert Schlag and Tony Turkovich.



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Outreach *continued from page 1*

and outreach program; however, it provided an opportunity for WCAHS Research Coordinator Stephen McCurdy to re-evaluate the center's future outreach activities. In doing so, he established the Community Outreach for Research & Education (CORE) component for WCAHS. In April 2006, Elizabeth Noceti-DiDio joined the center as its education and outreach coordinator (see article on page 4).

The teamwork has been fruitful in developing CORE's direction, which aims for building a university-community partnership to investigate broader issues of health and safety in agricultural communities. O'Connor-Marer's training model was unique and impressive, and we would like to carry on with the principles of his model. To learn more about our community outreach, please visit our Web site at <http://agcenter.ucdavis.edu/>.

Join our list server!

Among its many electronic communications, WCAHS has an e-mail list server called "aghealth." It is open to anyone interested in agricultural health and safety. We welcome and encourage everyone involved in agricultural health and safety to participate by posting to it. To subscribe, visit our Web site at <http://agcenter.ucdavis.edu>, and click on "AgHealth E-mail List."

AgHealth News is published quarterly by the Western Center for Agricultural Health and Safety, University of California, Davis CA 95616-8575; phone (530) 752-4050; FAX 752-5047; e-mail: agcenter@ucdavis.edu
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Our 2006-2007 Seminar Series will be held the first Monday of the months of Oct. through June at 4 p.m. in 3201 Hart Hall (except Jan., which will be the second Monday).

Please check our Web site at <http://agcenter.ucdavis.edu> for updates on 2006-2007 Seminar Series and September conference.