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Western Center for Agricultural Health and Safety • University of California, Davis

Synergistic relationships to examine pesticide exposure in families

By Deborah Bennett

The Western Center for Agricultural Health and Safety is currently conducting a study that is a result of multiple groups working together in synergy. WCAHS Director Dr. Marc Schenker is conducting MICASA, a community-based cohort study examining occupational and environmental risks and the relationship to health in more than 400 farm worker families residing in Mendota, California. The laboratory of Dr. Bruce Hammock in the Department of Entomology, another group involved with the Ag Center, has been developing immunoassays for pesticides. These assays provide a rapid, low-cost alternative to instrumental analysis for the quantitation of pesticides.

Ag Center investigator and UC Davis Associate Professor of Public Health Sciences Deborah Bennett saw the opportunity to develop a project to look at exposure to pesticides for the study participants of the MICASA project. There was one component missing – researchers did not have a method for including air measurements in the study.

As a result, another synergistic relationship was formed. The California Department of Pesticide Regulation (DPR) was looking for a community in the Central Valley in which to conduct air measurements. Randy Segawa, Cal/DPR's environmental program manager, suggested the two groups work together. One of the concerns DPR researchers had was whether or not central site monitoring was representative of toxins people are exposed to in their homes. The MICASA study platform provides a perfect opportunity to explore this question.

Pesticide exposure to children is of particular concern because their systems are still developing. Also, children's unique behaviors, including hand-to-mouth activity, increase the amount of pesticides to which they are exposed. Pesticide exposure results from multiple exposure pathways. As a result of agricultural applications, pesticides can be found in the outdoor air where the population lives. This air enters the home, at which time the occupants are exposed through inhalation. Children breathe at a higher rate per-unit body weight than adults, resulting in higher exposure. In addition, a portion of the pesticide is either deposited or partitioned onto the surfaces in the home. These pesticides can remain for an extended period, since they are broken down by sunlight, and there is no sunlight indoors.

Pesticides are applied in the home to address pest problems. Since these products are applied indoors, again out of the sun, they can remain there for some time, particularly on surfaces. Due to the poor housing quality generally available to migrant farm workers, pesticides may be applied more frequently than in the general population. Additionally, people are exposed to pesticides from the foods they eat, particularly foods that were applied with the pesticide of concern. Growing children eat more per-unit body weight than adults.

The pesticide component within the MICASA project plans to enroll 125 households who have a child age 5 or under. The young child and the mother are the participants in the study.

From left, Clarice Ando and Shifang Fan of the California Department of Pesticide Regulation, have taken readings from the air sampler and are reparing to take it out of a participant's home.

On the first day, both MICASA staff and the staff of the DPR (Roger Sava, Bryan Crouch, Brittany Kolbe, Clarice Ando and Shifang Fan) will visit the home to set up an air sampler that will remain during the study period. MICASA staff will leave containers for the participants to collect what is called a "duplicate diet," which is an exact copy of everything the participant eats. For example, if they eat a cup of fruit salad, they would put a cup of fruit salad in the container. The staff also will leave containers to collect urine samples.

Participants are asked to collect their last urine of the day. MICASA and DPR staff will return on the third day to collect the air, food and urine samples.

Kelly Trunnelle, a graduate student in the UC Davis Department of Environmental Toxicology, and a member of the Agricultural and Environmental Chemistry Graduate Group, will collect a dust sample from the home to represent surface concentrations. A questionnaire will be completed to learn about pesticide use in and around the home and to collect information about housing conditions. All samples will

Pesticide exposure *continues on page 4*

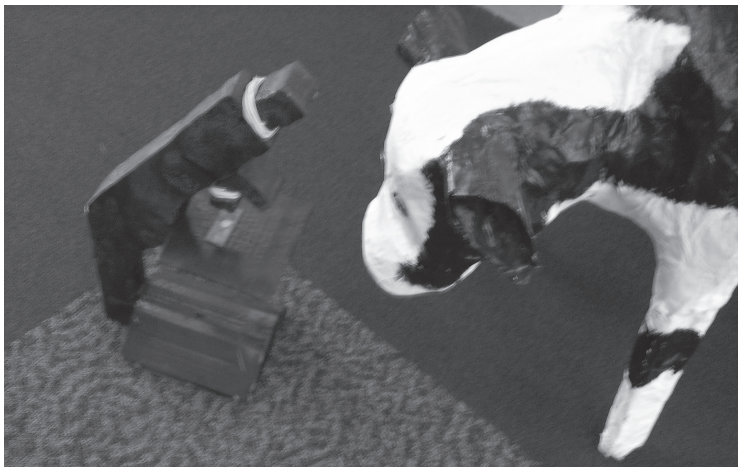
Green Acres, Blue Skies II air quality conference

As increasing numbers of politicians and public advocates call for mandatory reductions in air pollution, many producers are generating new ideas for how to better regulate their pollution footprint – be that with new farming practices, improved mitigation and control technologies, converting diesel farm equipment, or generating carbon offsets.

Green Acres, Blue Skies II air quality conference convened June 1-2 to bring together key stakeholders working towards creating a cleaner and more sustainable agricultural industry. The conference included field trips and workshops addressing mobile and non-mobile engines, energy production, animals, plants, fertilizers, sequestration, particles, VOCs, health effects and economics.

Researchers at the UC Davis Air Quality Research Center and the Agricultural Air Quality Center are breaking new ground with studies ranging from the cardiopulmonary effects of inhalation of particulate matter; to the fate and transport of various chemicals in the atmosphere; to devising new methods for quantifying pollutants; to analyzing the effects of emission on animal health; to converting agricultural waste materials into energy. This cutting-edge science informs the public policy debate which generates legislation and regulatory frameworks which in turn impact the production of food.

Chaired again this year by Frank Mitloehner, an animal scientist and air quality specialist in the UC Davis Department of Animal Science, conference organizers included Donna Reid and Peter Green. The diverse Program Committee included: J.P. Cativela, Dairy CARES; Cynthia Cory, California Farm Bureau Federation; Kevin Eslinger, California Air Resources Board; Rolf Frankenbach, California Department of Agriculture; Sheraz Gil, San Joaquin Valley Air Pollution Control District; Greg Johnson, USDA Natural Resources Conservation Service; Allison Jordan, California Sustainable Winegrowing Alliance; Susan Kegley, Pesticide Research Institute; James Liebman, U.S. EPA; Gabriele Ludwig, California Almond Board; Marc Schenker; James L. Sullins, University of California Cooperative Extension.



Conference display: Lab cow doing microscopic research on fine particulates.

"This was an exciting and important meeting because it covered several current issues in respiratory health among agricultural populations, but even more importantly because it brought together a diverse group of disciplines and constituencies: ag producers, government, academia and the public, said Marc Schenker, M.D., MPH, director of WCAHS.

"When all of the parties can get together and discuss the issues, there is the right ingredient for increasing our common understanding and making progress in addressing the issues that affect everyone."

Rupali Das, M.D., MPH, of the Chief Environmental Health Investigators Branch, California Department of Public Health and conference chair, chats with Dr. Robert Harrison, UCSF and Dr. Marc Schenker, WCAHS director.

A one-day conference titled, "Safer Alternatives for Pest Control in Agriculture - Making the Public Health Case for Change," sponsored by the California Department of Public Health, the Center for Occupational and Environmental Health (COEH) and the Western Center for Agricultural Health & Safety (WCAHS) was held on May 28 in the Activities and Recreation Center (ARC) on the UC Davis campus. Attending the sold-out conference were growers, manufacturers, pesticide regulators, county agricultural commissioners, industrial hygienists, safety professionals, researchers and occupational health nurses and physicians.

Leigh receives NIOSH Director's Award

Paul Leigh, a professor of health economics in the UC Davis Department of Public Health Sciences, and a WCAHS researcher, received the Director's Award last October from the National Institute for Safety and Health (NIOSH). The award was presented for his work on developing estimates of the national costs of occupational injury and illness, and his efforts to promote the use of these figures to improve worker safety and health.

Dr. Leigh has worked to generate a scientific estimate of the national costs of occupational injuries and illnesses for civilian workplaces across the nation as well as for 19 separate occupational illnesses, and will be forecasting costs for 2010 through 2015. His estimate from the 1990s indicated that costs of occupational injuries and illnesses were on a par with the costs of cancer. The same estimate showed injuries comprised roughly 85 percent, while illnesses comprised 15 percent, of total costs.

Acting NIOSH Director Christine M. Branche said, "This project highlights the important work being conducted by NIOSH and NIOSH-funded researchers to further the understanding of the hazards faced in the workplace that will help us to focus our work to address the highest research priorities."

High school student receives Air Quality/Climate Change Award

Evaline Cheng, now a senior at Lynbrook High School, receives the "Air Quality/ Climate Change Award" from Paul Williamson, representing the Southern California Air Quality Management District.

Last summer, Evaline Cheng participated in the 2008 Youth Science Project (YSP) under the direction of Kent Pinkerton, director of the Center for Environmental Health (CHE), and WCAHS associate director, along with Laurie Hopkins, Environmental Toxicology Graduate Group. Later, at the Santa Clara County Fair, Evaline received first place in the Medicine/Health category and was invited to participate in State Fair competition, entering her research project titled, "Nasal Responses of Exposures to Ultrafine Iron Soot Particles in Mice."

Evaline reported that, "For the State Fair, we flew to USC. A few other YSP'ers were also there with their projects. It was so exciting to see such diverse and exciting research projects by other high school students. One of the most interesting projects I saw looked at the skin smoothing properties of urine. At the State Fair, I got second place in the Pharmacology category and the Air Quality special award."

Evaline thanked Pinkerton and Hopkins for teaching her about histology and research, opening up the lab and allowing her to "gain the best learning experience possible."

Evaline Cheng receiving her award from Paul Williamson, representing the Southern California Air Quality Management District.

Australian visitor compares notes on ag health and safety

Dr. Tony Williams, team manager for WorkCover, New South Wales Manufacturing, was recently awarded a Winston Churchill Fellowship to conduct research studies in the United Kingdom, Canada, the United States and France. His research is aimed at identifying initiatives that may have the potential to be applied in Australia to reduce fatalities and injuries on their farms.

On May 29, Dr. Stephen McCurdy met with Dr. Williams and stated that he enjoyed comparing notes on agricultural health issues with an Australian colleague.

In his correspondence to WCAHS, Williams wrote, "I would like to get a detailed overview of what the Western Center or organizations that might collaborate with you, have been trying (programs and initiatives) to improve farm safety, and how you have been engaging industry, rural communities and other stakeholders to work with you. I am particularly focused on change coming about not as a result of the legislative big stick approach but where programs and initiatives have been applied to convince, influence, encourage and or coerce the farmers and or their communities into action.

I am very much trying to understand the drivers that best influence behavioral change and, put simply, how we can most effectively get into the heads of farmers to move them towards not being risk takers or allowing their staff to work in high-risk situations on the farm. I will add that the things I am most looking for may be the subtle differences in how you develop, implement or drive farm safety initiatives."

For follow-up or questions, Dr. Williams can be reached at: tony.williams@workcover.nsw.gov.au

Tony Williams of New South Wales discusses agricultual health and safety with WCAHS Director of Education Stephen McCurdy.

Welcome new EAB members

The Western Center for Agricultural Health and Safety (WCAHS) is pleased to welcome two new External Advisory Board members:

AnaMaria "Ria" de Grassi, director, National Affairs and Research, Animal Welfare, Livestock & Agriculture California Farm Bureau Federation, Sacramento; and

Guadalupe "Lupe" Sandoval, former Ag Center Pesticide Safety Specialist (1991-1995)
Sandoval Bilingual Safety Solutions, Sacramento
Workplace safety consultation, solutions and training.

The WCAHS External Advisory Board (EAB), formed by a spectrum of individuals representing diverse agricultural health stakeholders throughout the state, provides input on a semi-annual basis regarding the needs and concerns of the greater agricultural community, and feedback on the activities of the Center in response.

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be analyzed for permethrin and permethrin metabolites. Researchers plan to measure for additional pesticides in the future.

On any given week, there will be approximately six households in the study. DPR will collect indoor and outdoor air samples at most of the households. In addition, DPR has established two ambient air monitoring sites in Mendota, one on the roof of the MICASA office and one at a fire station. All of the air samples will be analyzed for multiple pesticides. This will allow DPR to look at variability in pesticide concentrations throughout a variety of homes at one time, as well as make comparisons between indoor and outdoor residential air concentrations.

"Ultimately, we hope to understand the relative contribution of various exposure pathways to overall exposure. Through the air, dust and food samples, we can measure the environmental concentrations to which people are exposed," said Bennett. "As these pesticides are rapidly metabolized in the body, the urine integrates the exposures from various pathways into a single, overall exposure measure."

For more information about this project, contact Deborah Bennett at dhbennett@ucdavis.edu.

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Calendar of Events

September 9

"Migration and Health Research Center" Press Conference, Reception 5-7, 1140 K Street, Sacramento

September 18

WCAHS 2nd Annual Outstanding Achievement in Farm Health and Safety Recognition Award reception, RJ Phillips Winery, Esparto, 4:30-6 p.m.

October 5

Len Welsh, chief, Cal/OSHA, will present "Occupational Health and Safety in California Agriculture: a Regulatory Perspective" during the WCAHS Seminar Series, 4-5 p.m., 3201 Hart Hall, UC Davis Campus

November 2

Michael O'Malley, M.D., MPH, medical director for Occupational Health Services at UC Davis, will present "Community Exposure to Agricultural Fumigants" during the WCAHS Seminar Series, 4-5 p.m., 3201 Hart Hall, UC Davis Campus

The 2009 WCAHS seminar series is available via video webcast at http://agcenter.ucdavis.edu/seminar/webcast_2009.php