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WCAHS collaborates in \$6 million study of egg production in U.S.

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WCAHS is participating in a comprehensive study funded by the Coalition for Sustainable Egg Supply (CSES) to understand the sustainability impacts of various laying hen-housing systems in the United States. The \$6 million study is commercial in scale and compares housing alternatives for egg-laying hens. Three types of housing are being evaluated: cage-free (aviary); enriched housing, which includes nests and perches; and conventional housing currently used to supply a majority of the eggs in the United States.

The investigation is being led by the University of California and Michigan State University. The design is comprehensive; the sustainability of the housing types will be evaluated for their environmental impact (effluent and generation of air pollutants), economics (production costs and food affordability), egg quality and food safety, animal health and well being, and worker safety, including ergonomics.



Conventional housing



Enriched housing



Aviary housing

UC Davis groups are studying the environmental impact (manure, gaseous and particle emissions from the housing types) in conjunction with Iowa State

University. Bird behavior is being evaluated by teams from Michigan State and UC Davis' Department of Animal Science. UC Davis is also participating in

the economic evaluation of the systems. A team from WCAHS and the UC Davis Department of Animal Science, headed by Professor Frank Mitloehner,

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On March 21, Cal-OSHA's 2012 Summer Heat Illness Prevention (HIP) team met in Oakland to review last summer's HIP strategies and outcomes, and to solidify the Summer 2012 plans. Team members shown from left are: Chris Lee, Cal-OSHA's deputy chief; Dean Fryer, Cal-OSHA's public communications representative; Ellen Widess, Cal-OSHA chief; Suzanne Teran, HIP project coordinator for LOPH at UC Berkeley; Laura Stock, LOHP Public Programs; and Garrett Brown, Cal-OSHA HIP director. Not pictured, HIP Team Coordinator Sandy Freeland of UC Davis' Western Center for Agricultural Health and Safety.

is investigating the personal exposures of the workers to ammonia and particles over the course of their workday in different seasons, and assessing any respiratory health impacts. More detail on this area of the comprehensive research study follows.

Air pollutant exposures and related health effects in egg facility workers

Respiratory exposures harmful to worker health have long been documented in poultry farms, and the frequency of symptoms has increased with conversion to large indoor animal confinement facilities. If present in large enough quantities, particles may irritate the pulmonary system in a nonspecific way by overwhelming the clearance mechanisms of the respiratory tract.

Fine particulate matter can reach deep into the lungs and may affect other body systems. Inhaled organic matter, for example endotoxins from gram-negative bacterial cell walls, are capable of producing allergic responses as well as irritation. Ammonia, adsorbed onto dust particles, is an alkaline respiratory irritant.

Airborne dust, including biological material such as bacteria, molds and other irritating or allergenic particles produce decreases in pulmonary function, which may be

amplified by interactions with ammonia. These pollutants increase work-related cough, phlegm, eye irritation, chest tightness, fatigue, wheezing, nasal discharge, headache, throat irritation and fever. The initial reaction of the airways to inhaled irritants is to induce inflammatory reactions. The exact mechanism is not clear, but researchers know that an acute inflammatory response occurs involving cytokines as interleukin (IL)-1, IL-6, IL-8 and tumor necrosis factor. Although individual responses are variable, the most common long-term effects include the development of bronchitis and chronic cough.

Worker health study design and approach

The worker respiratory health component of the study aims to compare the contaminants (particles and ammonia) in the air of the three housing types – aviary, enriched cages and conventional cages. In addition, it will determine whether or not an association exists between housing type and respiratory function of workers.

Investigators will monitor the worksite in each of the three major seasons: summer, winter and the transitional spring season, as temperature, humidity and ventilation rates in the houses differ among seasons. In addition, investigators will monitor the



Worker wearing backpack exposure assessing system.

flocks at different stages of development as the production of waste, antigens and other bird products change as they mature.



Nitric oxide in exhaled breath test.

During each monitoring period, workers will wear a lightweight backpack system collecting particles and ammonia to measure the types and concentrations of air pollutants to which they have been exposed. This assessment will include both measurement of fine particles (PM 2.5) and total exposure to particles of all sizes (total suspended particles). The samples will also be assessed for endotoxin content. Each worker is assigned to only

one type of housing per shift.

Pulmonary function will be measured before and immediately after each work shift. A second test, Nitric Oxide in exhaled breath (eNO), will be used to non-invasively assess possible airway inflammation. In addition each worker will answer a series of questions to assess respiratory symptom differences between the end and start of their work shifts.

Once monitoring has been completed, researchers will have sufficient data to investigate the main goals of the study and take into consideration modifying factors such as the length of time workers wear respiratory protection, different numbers of birds in each housing and per unit area.



Spirometry test (pulmonary function assessment).

For more information on WCAHS' involvement in the study, contact Diane Mitchell at dcmitchell@ucdavis.edu.

NIOSH engineer and ROPS advocate Tony McKenzie visits WCAHS

The Agriculture Fishing and Forestry (AFF) Program at NIOSH has partnered with appropriate federal and state agencies to establish additional interagency collaborations to increase the capacity for carrying out research and transfer activities.

On March 26, a stakeholder meeting, titled “In-farm Transportation of Farm Workers,” was held in Modesto, Calif. The Western Center for Agricultural Health and Safety (WCAHS) helped to facilitate the travel arrangements for NIOSH engineer Tony McKenzie from Morgantown, West Virginia, who led in the development of a new standard that defined minimum performance requirements for manufacturers and designers in the initial development of auto-deployable ROPS (roll-over protection systems).

McKenzie was one of three outside agricultural safety engineers invited by Cal/OSHA to speak and field questions on the inherent dangers of tractor rollovers and prevention of fatalities and traumatic injuries while transporting workers on tractors and farm trailers during irrigation field work in California.

The other outside panel members were Victor Duraj of UC Davis, and Richard Cavaletto from Cal Poly San Luis Obispo. More than 35 representatives of major farm and agricultural associations, individual growers, AgSafe, and farm labor contractor associations, as well as worker advocates from

the California Rural Legal Assistance Foundation were in attendance.

On March 27, McKenzie attended the WCAHS Steering Committee meeting and discussed his past and current research efforts. The two parties (NIOSH and WCAHS) explored possible ways to collaborate research efforts in the future.



From left, Marc Schenker, director of WCAHS; Tony McKenzie, NIOSH engineer; Professor Jerry Last, WCAHS investigator, Project 3/Poultry; and (back) Jay Schreider, CalEPA primary state toxicologist, discuss ways to collaborate in future projects.



Harvard Fong (left), senior industrial hygienist with the Exposure Monitoring and Health Investigation Program, Worker Health and Safety Branch, California Department of Pesticide Regulation, co-presented with Michael O'Malley, M.D., MPH, of the

UC Davis Center for Health and the Environment, at WCAHS' June 4 seminar.

During their talk, titled, “Agricultural Industrial Hygiene: Dermal versus Inhalation Exposures,” Fong presented several fumigant case studies, beginning with the UC Davis IPM definition of Fumigant: “Vapor or gas form a pesticide used to penetrate porous surfaces for control of soil dwelling pests or pests in enclosed areas or storage.”

His fascinating PowerPoint presentation, which details, for example, Methyl Bromide and Sulfuryl physical properties, toxicology symptoms, air monitoring exposure levels, workplace evaluation/hazard assessment and recommendations, is available at the WCAHS website: agcenter.ucdavis.edu. Click on “Seminar Series Web/Podcast/Powerpoint.”



From left, Julie Rainwater speaks with WCAHS Director Marc Schenker and Associate Director Kent Pinkerton after her presentation about UC Davis' Research Education Outcomes Evaluation Unit.

Julie Rainwater, Ph.D., director of the Research Education Outcomes Evaluation Unit at the UC Davis School of Medicine's Clinical and Translational Science Center (CTSC), was guest speaker at WCAHS' May 14 seminar.

Rainwater presented "Program Theory-Driven Evaluation in the UC Davis Schools of Health," in which she outlined the approach to evaluating centers and programs in the UC Davis Schools of Health, which include the Western Center for Agricultural Health and Safety. Rainwater, who is also a WCAHS investigator for program evaluation, described the steps for developing an effective evaluation, including stakeholder engagement, using logic models, and insuring that evaluation findings are useful for program improvement.



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On April 2, Diane Mitchell (above), Ph.D., WCAHS' research projects coordinator, presented "Occupational Risks in Large-Scale Livestock and Poultry Operations" for Frank Mitloehner, WCAHS' principal investigator for the study. Seated (from left) are C.Bryan Little, director of labor affairs for California Farm Bureau Federation, and new WCAHS Executive Advisory Board (EAB) member; and Bill Krycia, CalOSHA, EAB Chair.