

Western Center for Agricultural Health and Safety (WCAHS)

*Protecting farmers, farmworkers,
farm families and their communities*



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SECTION I

CENTER SUMMARY

Agriculture in the Western United States represents one of the most intensive and productive operations in the world. California's agricultural industry alone is the largest in the nation, producing nearly half of US-grown fruits, nuts and vegetables, and in 2013, California's agricultural production was valued at \$46.3 billion. WCAHS' overall goals are to develop research results that can be translated into effective work-place interventions, implement outreach/intervention programs (with a particular focus on vulnerable agricultural populations), evaluate agricultural injury costs, and maintain and create communications with regional growers, industry, labor, governmental and non-governmental organizations (NGOs) addressing agricultural safety and health. WCAHS at UC Davis is uniquely situated to address important current and emerging issues based on its strategic location in the heart of California's Central Valley and its co-location with UC Davis Schools of Medicine and Veterinary Medicine, and the Colleges of Agricultural & Environmental Sciences and Engineering. The multidisciplinary nature of the Center faculty has facilitated a wide variety of field-oriented research projects, along with diverse trainings and multi-lingual educational programs, and interventional prevention programs.

RELEVANCE

Agriculture is one of the most hazardous occupations, and more than 30% of the nation's farm workers live in the four western states covered by WCAHS: California, Nevada, Arizona, and Hawai'i. WCAHS has direct public health importance by increasing the understanding of what causes disease in this population and applying the findings to develop interventions to reduce injury and illness.

WCAHS maximizes the impact of NIOSH Center funding by obtaining extramural funding (e.g., NIH), nurturing existing partnerships (e.g., CalOSHA, CalEPA and Cal Department of Pesticide Regulations (DPR)) and building new NGO/private industry partnerships (e.g., Reiter Affiliated Companies, the largest multi-berry producer in the world). Partnerships and campus graduate student support continue to allow us to broaden our impact, enhance outreach and training activities, and nurture the next generation of researchers. Substantial matching funding from UC Davis further allows us to leverage the core Center funding from NIOSH.

WCAHS' outreach and public communication efforts are comprised of diverse media outlets, e.g., webpage: <http://agcenter.ucdavis.edu>, quarterly newsletters, multi-social media outlets that include a joint NIOSH 10-Ag Center Health & Safety YouTube channel, Facebook, and others. The successes and outcomes of all Center activities are evaluated within our comprehensive evaluation program on an on-going basis.

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SECTION II

PROGRAM HIGHLIGHTS

ADMINISTRATIVE CORE

The WCAHS Administrative Core provides the infrastructure, outreach/relationship building, and support for the Center's day-to-day functions (e.g., management of the NIOSH grant and multiple sub-contracts, including convening the Administrative Committee, Steering Committee, External Advisory Board, and Strategic Planning retreat). Administrative Core management provides leadership input for NIOSH and NORA/AFF collaborative efforts and guides WCAHS' three Administrative Core programs: outreach, pilot grants/feasibility, and evaluation. These are described in detail below.

Center-Wide Activities

WCAHS continued convening stakeholders through Steering Committee and Executive Advisory Board meetings to keep stakeholders apprised and solicit input on future WCAHS projects. WCAHS enhanced its communications activities with increased attention to social media. We have planned an all-day social media workshop and communications training with Dr. Max Lum of NIOSH, to be held on October 12, 2015. We will also host an External Advisory Board meeting in October.

Outreach Program

The Outreach Program has been an integral part of WCAHS since its inception over 25 years ago. The Outreach Program is directed by WCAHS investigator Stephen McCurdy, MD, MPH, in cooperation with Outreach and Education Specialist Teresa Andrews. The Outreach Program has three main aims:

- Promote communication among and between WCAHS investigators;
- Promote communication between WCAHS investigators and other NIOSH-sponsored Agricultural Health and Safety Centers;
- Develop and sustain partnership between WCAHS and key stakeholders in the agricultural community and promote dissemination of research findings and best practices to that community, including but not limited to farmers, farm workers, policy makers, local and state representatives, *promotores* (lay community members trained as leaders and sources of information regarding occupational health), and nonprofit agencies.

The Outreach Program team promotes these aims in collaboration with WCAHS investigators, outreach personnel at other NIOSH-sponsored Agricultural Health and Safety Centers across the

nation, and a diverse array of community members, leaders, and organizations. We describe below our efforts to meet these aims.

Promote communication among and between WCAHS investigators. Teresa Andrews, WCAHS Outreach and Education Specialist, meets periodically with all Center investigators to assist in developing and optimizing each investigator's community outreach efforts. During the past year, Ms. Andrews conducted two workshops for the Heat Illness Prevention Project (San Bernardino, 16 participants; Fresno, 30 participants) to identify sites to conduct research. For the Rapid Assays project, Ms. Andrews conducted outreach with landscapers (25) and pesticide applicators (25) to identify research subjects to participate in a survey and provide a urine sample to be tested for pesticide levels.

Promote communication between WCAHS investigators and other Agricultural Health and Safety Centers. Ms. Teresa Andrews, WCAHS Outreach and Education Specialist, attends regular meetings of the Evaluators, Coordinators, and Outreach (ECO) Group comprising 56 outreach personnel from each of the NIOSH-sponsored Agricultural Health and Safety Centers across the U.S. The ECO group is a forum for sharing experience relevant to the various outreach challenges each Center faces. The ECO group works closely with CDC/NIOSH to promote health and safety in the Agriculture, Forestry, and Fishing industry group that the Agricultural Health and Safety Centers are meant to serve. Within ECO, the following work groups have been established:

- **Awareness Work Group** – Promotes safety campaigns through two nationally recognized events: National Agriculture Day (3/15/2016; <http://www.agday.org>) and National Farm Safety & Health Week (9/20-26/2015; <http://www.necasag.org>)
- **Evaluation Work Group** - Develops best practices for collecting, analyzing, and reporting Ag Center data
- **National Ag Safety Database Work Group** – Acts as online clearinghouse (<http://nasdonline.org>) of safety education materials for agriculture
- **YouTube Channel Work Group** - Advances health and safety education in the Agriculture, Forestry, and Fishing industry sector with a peer-reviewed YouTube channel



it's a lifestyle.

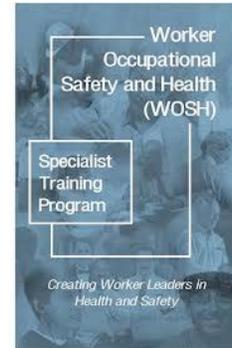
National Farm Safety
& Health Week
September 20-26, 2015

The WCAHS Outreach and Education Specialist contributes to the ECO Work Group activities through leadership and review of submitted Spanish-language videos and translation of flyers used to promote health and safety in agriculture.

Develop and sustain partnership between WCAHS and key stakeholders in the agricultural community and promote dissemination of research findings and best practices. Examples of community outreach efforts are described below.

- **Worker Occupational Safety & Health Training & Educational Program (WOSHTEP) with partner California Department of Industrial Relations**

This program is in its 6th year, with the goal of reducing job-related injuries and illnesses among California workers by promoting health and safety on the job. During the past year, we trained 30 farm labor contractors, growers, and supervisors to strengthen their knowledge and skills in areas of injury and illness prevention.



- **Heat Illness Prevention Education**

We conducted training for 16 growers, managers, and supervisors to assist them to develop their Heat Illness Prevention Plan and comply with the Cal/OSHA Heat Standard. During these meetings, participants were invited to participate in our Heat Illness Study. After sites have been identified, the research team visits them to explain the goal and methods of the research to potential subjects. The goal is to obtain data on internal body temperature as it relates to crop and geography, external heat, and internal metabolic loading, including accounting for work type and personal factors. The response was very positive. In addition, we conducted two heat illness prevention education and tail-gate training sessions for 60 farm workers throughout the Central Valley.

- **Collaboration with UC Statewide Integrated Pest Management (IPM) Program**



In collaboration with the UC Statewide IPM program, we created a series of materials to assist those in charge of conducting pesticide-safety sessions for farm workers. The materials include step-by-step guides and educational materials for supervisors to assist them in conducting brief 15- to 20-minute tailgate sessions on California's required training topics regarding pesticide safety. We have also conducted train-the-trainer sessions with farm labor contractors, safety officers, supervisors and

growers. Sessions have been presented in both Spanish and English, with 34 individuals trained.

- **Collaboration with the Health Initiatives of America (HIA)**

In collaboration with HIA, we conducted training of 26 grassroots community health and safety leaders (*promotores*) at the annual Promotora Health Conference on how to conduct brief presentations to farm workers regarding their occupational safety and health rights. Significant HIA outreach activities are discussed in *Appendix A* under the pilot study section.

- **Wellness program for farm workers**

The implementation of the wellness program for farm workers in collaboration with Reiter Affiliated Companies is going strong. The educational materials and discussion guides were tailored from a social media campaign implemented in Mexico and the U.S. National Heart, Lung and Blood Institute to better



fit the culture, language and educational level of the participants. The training includes interactive methods, and the sessions are conducted in the field during the lunch break.

- **Quarterly Newsletter, Blog, and Facebook**

The WCAHS Outreach Program utilizes a mixture of traditional and non-traditional media to engage with the agricultural community. The quarterly *AgHealth News* publication has a subscription base of approximately 225 persons and has been a part of the Center's communication efforts since the beginning. More recently we have begun to utilize "new media" outlets. We maintain a blog, providing topical information on a diverse range of agricultural health and safety topics. Go to <http://westernaghealthandsafety.wordpress.com/> to check out the blog. We also have established Facebook (www.facebook.com/AgHealthNewsUCDavis) and Twitter (@westernaghealth) accounts that continue to grow in their audience.

Pilot/Seed (Mini Grant) Program

WCAHS supports graduate student education and training and assists in connecting students to agricultural health and safety careers. The NIOSH-funded WCAHS Seed Grant Program seeks to encourage the development of creative research and translational, prevention/intervention training and outreach projects particularly by early-stage researchers interested in agricultural health and safety. The program is open to researchers in the WCAHS four-state region: Arizona, California, Hawaii, and Nevada. The WCAHS five-year NIOSH grant allows for drawing down an additional \$650,000 in UC Davis institutional cost-sharing funds through the campus Administrative Coordinating Council of Deans (ACCD). Over the past year, 10 graduate students received support via these funds.

WCAHS Seed Grants were awarded for grant year 2014-2015:

1. The effects of agricultural particles on pulmonary allergic responses: a focus on dendritic cells, Alejandro Castañeda, PhD Candidate, UC Davis;
2. Assessing clothing as a preventative method for heat illness in California's agricultural workers, Alondra Vega, PhD Candidate, UC Davis;
3. Heat exposure, dehydration, and kidney function in California's agricultural workers, Sally Moyce, PhD Candidate, UC Davis.

Pilot Grants were awarded for grant year 2014-2015:

1. Occupational health and safety awareness and education for Latino immigrants, Xóchitl Castañeda, Health Initiative of the Americas, UC Berkeley;
2. Joint Funding for Agricultural Health and Safety Projects in Developing Countries;
3. Joint Funding for National Institute of Environmental Health Sciences Core at UC Davis;
4. Sponsorship of the National American Hmong Farmers annual conference, Fresno, CA
5. Sponsorship of the *¡Que Viva la Vida!* farmworker conference in Esparto, CA.

See Appendix A for more information on pilot and seed grants.

Evaluation Program

WCAHS continues to work with Dr. Julie Rainwater and her evaluation team to assess the impact of WCAHS research, interventions and outreach. The following are examples of specific evaluation efforts:



- **Project Evaluation:** The evaluation team meets annually with WCAHS investigators to review program-specific logic models and document activity, outputs and outcomes of Center projects. The evaluation team extracts publications and grants that are potentially associated with the project based on lookups in SCOPUS and NIH Reporter. Data on honors and awards, accomplishments, scientific products, media coverage, presentations, success stories, and individuals supported are also collected by the evaluation team from annual progress reports, WCAHS newsletters, personal communication, and online searches. The evaluation team supplies a current list of all potential outputs and outcomes to investigators. Investigators review and confirm which outcomes and outputs they wish to attribute to their work with the Ag Center and enter any additional information. Final outputs and outcomes are entered into a database management system for WCAHS utilizing FileMaker Pro software.
- **Evaluation of WCAHS Outreach and Translation:** The evaluation team facilitated a focus group with outreach leaders Dr. Stephen McCurdy and Teresa Andrews to discuss strategies for disseminating and encouraging use of WCAHS findings. After the focus group, recommendations were provided to the outreach leadership for future dissemination strategies. The evaluation team also assisted outreach leaders to develop evaluation tools for community events, such as *¡Que Viva la Vida!*
- **Presentation Materials:** The WCAHS evaluation team continued to update and refine materials describing the Center's impact on agricultural risk, costs, and impact. New material on the WCAHS summary document features accomplishments of the Center in the areas of heat illness prevention, respiratory disease, ergonomic solutions, pesticide exposures and outreach.
- **Cross-Center Collaborations & Contribution to National Efforts:** As a member of the NIOSH AFF initiative-wide evaluation workgroup, Evaluators, Coordinators, and Outreach personnel (ECO), the WCAHS Evaluation Program played a leading role in producing several cross-center products, including a repository of compelling outcomes from the NIOSH Ag Centers, available on a Dropbox site. Each of the 10 NIOSH Ag Centers contributed documents to the repository, and these documents were filed and indexed by Center and by research topic. The repository provides evaluators from all participating Ag Centers with access to cross-center program information, best practices, and relevant statistics and research for agricultural health and safety. The

Evaluation Program Director, Dr. Julie Rainwater, attended the NIOSH Center Directors' Meeting in March 2015 in Cincinnati, OH. During the Directors' meeting, Dr. Rainwater shared the recommendations of the ECO group on evaluation, presented the NIOSH/NORA AFF logic model, and discussed ways the ECO group can focus on intermediate outcomes that are aligned with NIOSH reporting platforms. Dr. Rainwater also presented several models of how activities and stories are currently captured at the various Centers.

RESEARCH PROJECTS

Project 1: Effects of California agricultural particulate matter in a murine intranasal sensitization model of allergic airway inflammation

PI Kent Pinkerton, PhD; Co-I Keith Bein, PhD

Challenges

- Assess the relative toxicity of size-segregated particulate matter (PM) in California's Central Valley, which is greatly affected by agricultural exposures, such as PM.
- Establish the most scientifically sound methods for (i) extracting PM from the collection substrates prior to toxicological testing, (ii) administering the extracted PM doses during exposure studies, (iii) chemically characterizing the PM exposures, and (iv) testing the biological reactivity of numerous PM samples.



Impacts

- Toxicity screening of size-segregated PM common to California's Central Valley will lead to more targeted and effective strategies for regulating air quality to improve human health.
- We will better understand the relative risk of asthma development in the agricultural setting.

Milestones

- The final results of the intensive study evaluating PM from the ambient atmosphere in Fresno, CA, a large Central Valley city surrounded by agriculture and with high air pollution, have been presented this past year at numerous professional conferences, media interviews and webinars. The results will be published in the October 2015 edition of *Atmospheric Environment*. In brief, vehicular emissions, the regional background PM mixture – which is dominated by agricultural emissions – and residential and commercial

cooking emissions were found to significantly cause inflammatory responses depending on PM size and the season.

- From our experiments, we have determined that the most reliable way to measure the toxicity of coarse particles, a dominant particle size in agricultural dusts, in the lungs of mice is via intratracheal instillation rather than intranasal aspiration. The particles were from an agricultural setting at the Kearney Agricultural Research and Extension (KARE) Center in Parlier, CA. Different sizes of PM were collected at different times of day corresponding to (i) the nocturnal inversion (00:00-06:00), (ii) breaking of the nocturnal inversion (06:00-12:00), (iii) development of the mixed layer and peak actinic flux (12:00-18:00) and (iv) formation of the nocturnal inversion and residual layer (18:00-24:00). The collected PM samples are being extracted and analyzed for toxicological testing. The findings were published in the journal, *Integrative Pharmacology, Toxicology and Genotoxicology*.
- During the past year we have prepared a chapter and review supported under Project 1 on "Particle Toxicities," published as a Reference Module in *Biomedical Sciences* (Elsevier) and "Women and Respiratory Disease," published in the *American Journal of Respiratory and Critical Care Medicine*.
- We continue to develop our model of adult-onset asthma in female mice. Mechanisms of adult-onset asthma, which particularly affects women, is an understudied area. The condition is prevalent in the Central Valley of California, which has heavy PM pollution, and our model has the potential to help understand how adult-onset asthma develops. The initial work was presented at the 2015 International Conference of the American Thoracic Society.

Project 2: Using large national datasets (NAWS) and econometrics in agricultural injury research

PI J. Paul Leigh, PhD

Challenges

- Estimating differences among citizen, documented immigrant and undocumented immigrant farm worker household participation in the Supplemental Nutrition Assistance Program (SNAP) using data from the National Agricultural Workers Survey (NAWS). Explaining why these differences occur in the data using reasoning from an understanding of the design of the NAWS, legal requirements for SNAP, and economic and sociological theory.

Impacts

- Analysis of data from the Bureau of Labor Statistics' Survey of Occupational Injury and Illness (BLS-SOII) and the National Council of Compensation Insurance (NCCI) revealed that workers compensation benefits covered roughly only 20% of the true costs of occupational injuries and

illnesses nationwide. Coverage included NPR (<http://www.npr.org/2015/03/04/390441655/injured-workers-suffer-as-reforms-limit-workers-compensation-benefits>) and a special OSHA report on income inequality (<http://www.dol.gov/oshareport/20150304-inequality.pdf>).



- Analysis of data from the University of Michigan's Panel Study of Income Dynamics revealed that low wages were predictors of smoking. Media coverage included *Fortune Magazine* (<http://fortune.com/2015/08/07/minimum-wages-smoking/>).

Milestones

- Data from the Medical Expenditure Panel Survey (MEPS) and the Health and Retirement Survey (HRS) are being examined to estimate current disparities and time-trends in disparities between agriculture and all other industries for insurance coverage and physical functioning of persons employed in those industries.



- Final estimates of participation in the federal Women, Infants and Children (WIC) program by authorized and unauthorized farm worker households from the NAWS. We found that unauthorized households participate at almost the same rate as authorized households. We also found that

unauthorized households with 2+ children were more likely to participate than authorized households.

- Preliminary estimates of participation in the federal Supplemental Nutrition Assistance Program (SNAP), or food stamps program, were produced. We found that unauthorized households participate at roughly one-third the rate of authorized households. We also found that unauthorized households were far more likely than authorized households to increase their participation rate as more children were added to the family.
- Work continues to assess predictors of which groups of farm workers (e.g., authorized vs. unauthorized) are covered by insurance, access medical care, report barriers to care, work for contractors and work excessive hours. Data will be drawn from the National Agricultural Workers Survey (NAWS).



- Final estimates for participation in Medicaid by authorized and unauthorized households were produced. We found that unauthorized households participate at about half the rate of authorized households and that, again, the unauthorized were more likely to increase their participation with greater numbers of children in the household.

- Final estimates were produced regarding wages and smoking continuation among a representative sample of full-time U.S. workers drawn from the Panel Study of Income Dynamics. We found that low wages were a risk factor for smoking continuation.

Project 3: Impacts on new caging laws in California on worker health & safety in layer hen facilities

PI Jerold Last, PhD

Challenges

- To determine the effect on exposure of workers to toxic air pollutants upon housing layer hens in unconventional facilities required to achieve compliance with the new caging laws in California (and elsewhere).
- To evaluate effects on workers of worker exposure in unconventional facilities required to achieve compliance with the new caging laws in California (and elsewhere).
- To evaluate the toxicity of PM contained in ambient air being inhaled by workers in the San Joaquin Valley in the course of their normal workdays.



Milestones

- A manuscript summarizing our studies of mice exposed to PM collected from three different types of layer hen facilities, two Proposition-2 compliant and one traditional, has been completed and submitted to a peer-reviewed journal for consideration.
- A manuscript summarizing our studies of mice exposed to coarse PM administered by two different routes of administration, intranasal and intratracheal, has been published in a peer-reviewed journal. Harmonization of experiments performed using the two methods in the Pinkerton and Last laboratories can now be achieved.

PREVENTION/INTERVENTION PROJECTS

Project 4: Rapid assays for human and environmental exposure assessment

PI Bruce D. Hammock, PhD

Challenges

- The overall goal is to develop improved tools to detect pesticides in farm- and landscape-workers and to apply these tools to examine exposure levels.

Impacts

- “Researcher explains how alpaca’s genes can detect chemicals”, *Lodi Newspaper*.
http://www.lodinews.com/news/article_55bf4396-5205-11e5-a89d-7baa63007881.html



- Dr. Candace Bever interviewed on Capitol Public Radio, September 2, 2015, Science Night Live, antibodies and their uses. <http://www.capradio.org/miniplayer?id=56400>

Milestones



- The project has developed highly sensitive urine assays for herbicide, 2,4-D, and pesticide, fipronil, both having a limit of detection of approximately 0.1 ng/mL.
- Thirty-five participants were enrolled in the study for Specific Aim 3, which is to test the assays in the field. The majority of the participants are landscape workers working for large establishments, and so far 29 participants have provided urine samples on the day they applied pesticides.
- Our collaborator, Dr. Qing Li at the University of Hawaii, was able to recruit golf course pesticide applicators at two separate golf courses (one public and one private). Patch samples from the head, chest, back, upper arms, thighs, shins, and hands of applicators during the loading and spraying process were collected. Those samples will be analyzed to assess the exposure of workers to the plant growth regulator Trinexapac-ethyl. The team will continue the efforts to recruit participants.

Project 5: Reducing the risk of heat-related illness in western agricultural workers

PI Marc B. Schenker, MD, MPH

Challenge

- Advance the understanding of the physiological responses to increased environmental heat and physical exertion among farm workers through the analysis of personal characteristics, monitors and sensors.



Study workers harvesting melons, June 2015

Impacts

- Physiological data collected in 2014-2015 will assist in developing heat illness risk estimates specifically for farmworkers and improve on the currently used, old physiological data derived from intense, short-term work periods (e.g., firemen, military and athletes).
- Focus groups conducted by the California Institute for Rural Studies (CIRS) indicate that farmworkers prefer heat illness education to be participatory and delivered orally. Water was often not the beverage of choice, and workers were often suspicious of the quality of the water provided.
- In combination with the physiological results, new materials and methods will be developed to improve the success of farmworker heat illness prevention training.

Milestones

- Data analysis continues on the 354 study members who worked in farm labor tasks in the last year before they were interviewed. Forty percent of the workers (but 54% of the female workers) had experienced at least one symptom of heat-related illness. The most common symptoms in decreasing order were dizziness, nausea and muscle cramps.
- Summer 2015 field data collection is ongoing and will be completed September 23, 2015. Over 280 workers were monitored, as specified in the experimental plan for this year, in addition to the 300 monitored in the summer of 2014.
- Data from 2014 indicates that by the end of their shift, 72% of the workers lost weight, and about 9% lost enough to suggest they were significantly dehydrated. Males were significantly more likely to lose weight than females. Although only 2.5% said they had ever visited a doctor or clinic because of heat illness symptoms, 57% of the workers said they had experienced one or more symptoms of heat illness at work. Over 98% of workers said drinking water was always supplied in the fields, but 76% brought their own water or other beverage. The mean number of times they drank any beverage per work shift in hot weather was reported as 10 (median 8), which is well under the recommended 3-4 times per hour in hot weather.

Project 6: Effects of ladder rung spacing on agricultural workers

PI Fadi Fathallah, PhD

Challenges

- The ladder rung spacing project is a multi-year effort to model and develop an optimized ladder design to reduce falls in agricultural orchard work. The overall work includes theoretical modeling, laboratory testing and validation, and subsequently testing and

validation work in the production agriculture environment. Developing relationships with the ladder and orchard industries is an important element.

Impacts

- Potential to decrease ladder related injuries related to agricultural work and increase worker comfort and efficiency.

Milestones

- Obtained a full-17 sensor system to facilitate full-body motion analysis. The system was tested and validated for accuracy against other motion capture systems.
- Started the lab study trials evaluating 3D biomechanical kinematic response using five ladders (10, 10.5, 11, 11.5, and 12 inches) at three angles (72, 68, and 64 degrees).
- Continued relations with industry partners including fruit growers and ladder manufacturers, as well as extension farm advisors.
- Outreach has occurred effectively in several ways. **American Ladder Institute-** Discussed partnering with (ALI) adding orchard ladders module to their ladder safety library (currently covering step, single and extension, articulated, and mobile ladders). **Cal-OSHA Reporter** – Met with the publication’s editor to discuss a potential feature article about this project and other ag ergonomics interventions. **Ag Personnel Management Association** – Attended this event (<http://agpersonnel.org/>); about 50 copies the WCAHS Ladders blog was distributed. **Standards Australia-** Discussed with agency their current standards on ladders, which are different than US and European standards. Short presentations on the ladders project continue to be made during frequent tours of the Heidrick Western Center for Agricultural Equipment, where this ladders project is based on the UC Davis campus.



APPENDIX A – Pilot/Seed Projects Detailed Descriptions

Seed Project 1 – The effects of agricultural particles on pulmonary allergic responses: a focus on dendritic cells

Alejandro Castañeda, PhD Candidate, UC Davis (Major Professor: Kent Pinkerton)

Challenges

- The California Central Valley has some of the highest incidence rates of asthma in the U.S., a phenomenon related to the high levels of ambient particulate matter (PM) generated through anthropogenic processes, such as agriculture farming and vehicular transportation.
- The purpose of this study was to better understand how agricultural PM exacerbates asthma.

Milestones

- Young mice exposed to fine PM (PM_{2.5}) collected in Sacramento, CA, that contained both urban and agricultural PM sources, had an enhanced pulmonary allergic immune response as evidenced by increased levels of TH2 cytokines, chemokines, and oxidative stress enzymes.
- The results provide evidence that PM exposure during the allergic sensitization period—only in early life causes an immunological memory to attract significantly more inflammatory cells into the lung during subsequent allergic challenge, resulting in tissue injury.
- The findings from our study may provide mechanistic details as to how high levels of PM in the Central Valley may be increasing the incidence of asthma among its residents.

Seed Project 2 – Assessing clothing as a preventative method for heat illness in California’s agricultural workers

Deborah Bennett, PhD; Alondra Vega, PhD Candidate, UC Davis; Uwe Reischl, PhD, MD, Boise State University, ID

Challenges

- Global climate change is increasing, posing a threat to heat-related illnesses in occupations, such as agricultural laborers.
- Determine the optimal clothing scheme for agricultural laborers when working in varying conditions of extreme heat to prevent heat-related illness.

Milestones

- A mannequin was equipped with 6 different scenarios of garments and heated with infrared light to measure total heat loading and heat insulation from the clothes.

| Garment Set | Description | Total Heat Loading (Watts) |
|-------------|--|----------------------------|
| Control | Nude | 63.3 |
| 1 | Boxer shorts + black t-shirt (100% polyester) + denim jeans | 113.3 |
| 2 | Boxer shorts + white t-shirt (100% cotton) + short sleeve shirt + denim jeans | 140.0 |
| 3 | Boxer shorts + white t-shirt (100% cotton) + long sleeve shirt + denim jeans | 146.6 |
| 4 | Boxer shorts + white t-shirt (100% cotton) + short sleeve shirt + 100% cotton pants | 133.3 |
| 5 | Boxer shorts + white t-shirt (100% cotton) + long sleeve shirt + 100% cotton pants | 146.6 |
| 6 | Boxer shorts + basketball shorts + white t-shirt (100% cotton) + short sleeve shirt + sweatpants | 136.6 |

- Based on the results of the total heat loading, it is recommended that agricultural workers wear only one layer of clothing (garment set 1).
- Results can be used to design educational programs for farm workers about selecting proper protective clothing to minimize heat stress in the field.

Seed Project 3 – Heat exposure, dehydration, and kidney function in California's agricultural workers

Sally Moyce, PhD Candidate, UC Davis (Major Professor: Marc Schenker)

Challenges

- During California's summer harvest, agricultural workers are at risk for heat related illness. The body's response to increased workload in extreme temperatures is to create evaporative cooling through sweating. This mechanism may cause transient volume depletion, resulting in decreased blood flow to the kidneys and potentially acute kidney injury.
- Understanding the magnitude of occupational heat-related kidney dysfunction in agricultural workers is important to inform early detection measures and to plan occupational interventions for its prevention.

Milestones

- In a sample of 295 agricultural workers, acute kidney injury was found in nearly 12% of the workers after a single day of work in the fields.
- Diabetes was associated with 4.18 times the odds of acute kidney injury (95% confidence interval 1.12-15.56).
- Future work will focus on developing interventions for the prevention of kidney damage and collaboration with other scientists investigating the impact of the occupational risks of agricultural work on the health of the workers.

Pilot Project 1 – Online Certificate Program for *Promotores* on Agricultural Health and Accident Prevention

Health Initiative of the Americas (HIA), UC Berkeley

The overall goal of this project is to build a healthier and better-informed agricultural worker community in the U.S. by reducing occupational health and safety issues and promoting healthy lifestyles among Hispanic agricultural workers and their families. HIA is working on a new online certificate program for *promotores* (community health outreach workers) titled “Online Certificate Program for *Promotores* on Agricultural Health and Accident Prevention.” A minimum of 300 *promotores* working directly with the vulnerable Latino population in the area of agricultural health and accident prevention in the context of migration will be trained over the next 5 years. The long-term goal is to institutionalize this online certificate nationwide so community health outreach workers are better prepared to assist Latinos who work in agriculture.



HIA is working with the Autonomous University of Zacatecas (UAZ) and the Carlos Slim Foundation, and with two independent consultants with expertise in *promotora* training curricula. Curricula (*diplomado*) creation is taking longer than expected because every module must be adapted to meet the *promotoras* needs, such as language and literacy level. Three of the six modules are nearly complete. HIA staff has also revised relevant resources that will become the background materials for the online certificate program.

HIA anticipates completion of the *diplomado* in January/February 2016. This includes completion of the modules and transferring to the online platform. Once complete, testing will commence to work out any discrepancies or system glitches. Evaluation will take place simultaneously as the testing.

The **Binational *Promotores* Conference** took place on September 21, 2015, at the California Endowment offices in Oakland, California. More than 200 *promotores* attended. Eleven participants travelled from the Mexican state of Zacatecas as part of the Binational *Promotoras* Exchange program, representing the Mexican Institute of Social Security and the Ministry of Health of Zacatecas. Attendees represented 39 diverse institutions from all over California. A special workshop was devoted to training for this project, titled “Occupational Health and Accident Prevention in Farmworkers,” led by WCAHS Outreach Specialist Teresa Andrews.

Pilot 2 – Joint Funding for Agricultural Health and Safety Projects in Developing Countries

Blum Center for Developing Economies, UC Davis



The Western Center for Agricultural Health and Safety (WCAHS) partnered with the UC Davis Blum Center for Developing Economies to help impoverished communities around the world improve their agricultural health and safety. WCAHS and the Blum Center jointly funded six UC Davis undergraduate students and eight UC Davis graduate students to conduct agricultural health and safety related projects both in the U.S. and abroad in conjunction with a local non-profit or agency.

Hands-on opportunities allow undergraduate and graduate students to gain fieldwork experience in establishing change to problems that they are passionate about solving. The students, faculty and outside organizations affiliated with these projects aim to further the WCAHS’ and the Blum Center’s mission of assistance and aid domestically and abroad. This represents an excellent opportunity to train the next generation of leaders through experiential learning in agricultural health and safety.

Pilot 3 – Joint Funding for National Institute of Environmental Health Sciences Projects

Core Center for Environmental Health Sciences, UC Davis

WCAHS partnered with the NIEHS Core Center for Environmental Health Sciences at UC Davis to fund pilot projects for junior investigators. The Pilot Project Program supports short-term one-year projects to provide preliminary data for new extramural grant submissions in the area of environmental health sciences research. Projects were prioritized that advance environmental health sciences research in the targeted theme areas of respiratory health,

neurodevelopment and neurologic disorders, immune regulation, and reproduction/endocrine function with an emphasis on translational science relevant to humans.

Pilot Project 4 – National Hmong American Farmers

WCAHS helped sponsor the 2015 National Hmong American Farmers conference held in Fresno, CA. This is an annual event that brings useful information to the farmers, especially small growers, on economic, regulatory and other agricultural related issues. WCAHS Education and Outreach Specialist Teresa Andrews presented a session (with an interpreter) on government agencies that protect worker rights. A Cal/OSHA consultation person (Eugene Glendenning, Regional Manager) was there also. Forty people attended the session. Ms. Andrews also had an information table with heat illness prevention materials, and approximately 200 people received posters or flyers created by Cal/OSHA for their heat campaign. WCAHS has established successful outreach relationship with Chukou Thao, the executive director of the National Hmong American Farmers.

Pilot Project 5 – ¡Que Viva la Vida!



WCAHS sponsored the *¡Que Viva la Vida!* conference in Esparto, CA on Saturday, March 21, 2015. Approximately 20 farm worker Latino women attended the conference. The goal of the conference was to address the womens' physical, emotional, and spiritual well-being while providing them with necessary advice to improve their overall lifestyle. WCAHS Education and Outreach Specialist Teresa Andrews as well as

other presenters in attendance emphasized to the women the tremendous importance of working towards and maintaining good health in order to better provide for their family. The first presentation featured information about physical health and nutrition, such as a healthy and balanced meal. The second presentation dealt with domestic violence - what it looks like and the negative impact it has on families, specifically children. Afternoon presentations included talks on residency or citizenship, deportation, obtaining a driver license, college-level education and financial aid and scholarships.

APPENDIX B - WCAHS OUTPUTS

Publications

Castañeda, A.R.

Carosino CM, Bein KJ, Plummer LE, Castañeda AR, Zhao Y, Wexler AS, Pinkerton KE. 2015. Allergic airway inflammation is differentially exacerbated by daytime and nighttime ultrafine and submicron fine ambient particles: heme oxygenase-1 as an indicator of PM-mediated allergic inflammation. *J Toxicol Environ Health A*. 78(4):254-66. PubMed PMID: 25679046.

Fathallah

Duraj, V., Fathallah, F. Miles. J., Meyers, J., Guzman, D., and Hunter, T. (2015). Orchard Ladders with Shorter Rung Spacing for Stone Fruit Harvest. Proceedings of the 19th International Ergonomics Triennial Congress. Melbourne, Australia.

Wax, J. (2015). Take the Pain out of Farming. *Acres U.S.A.*, 56-60 (May issue).

Khosro Anjom, F., Rehal, F., Fathallah, F., Wilken, K., and Vougioukas, S. (2014). Sensor-based Stooped Work Monitoring in Robot-aided Strawberry Harvesting. American Society of Agricultural and Biological Engineers (ASABE) – CSBE/ASABE Joint International Meeting. Technical Paper Number: 141913911.

“Ergonomics- Intervention: Personal Weight Transfer Device Improves Back Pain.” *COEH Bridges*. Winter 2014.

“Spotlight on r2p: New Director of the California AgrAbility Project: Fadi Fathallah.” *COEH Bridges*. Summer 2015.

Hammock

Dong J, Xu C, Wang H, Xiao Z, Gee SJ, Li Z, Wang F, Wu W, Shen Y, Yang JY, Sun Y, **Hammock BD**. 2014. Enhanced sensitive immunoassay: noncompetitive phage anti-immune complex assay for the determination of malachite green and leucomalachite green. *J Agric Food Chem*. 62(34):8752-58. PMID: PMC4150606.

Hua X, Liu X, Shi H, Wang Y, Kim HJ, Gee SJ, Wang MH, Liu F, **Hammock BD**. 2014. Development of a heterologous enzyme-linked immunosorbent assay for organophosphorus pesticides with phage-borne peptide. *RSC Adv*. 4:42445-53. PMID:26290688

Liu X, Xu Y, Xiong Y, Tu Z, Li YP, He Q, He Z, Qiu Y, Fu J, Xiong L, Gee SJ, **Hammock BD**. 2014. VHH-phage based competitive real-time immuno-PCR for ultrasensitive detection of ochratoxin A in cereal. *Anal Chem*. 86(15):7471-77. PMID:PMC4306448.

Liu X, Xu Y, Xiong YH, Wan D, He ZY, Wang X, Gee SJ, **Hammock BD**. 2015. Development of a nanobody-alkaline phosphatase fusion protein and its application in a highly sensitive direct competitive fluorescence enzyme immunoassay for detection of ochratoxin A in cereal. *Anal Chem*. 87(2):1387-94. PMID: PMC4476795

Ranganathan A, Gee SJ, **Hammock BD**. 2015. An immunoassay for the detection of triclosan-O-glucuronide, a primary human urinary metabolite of triclosan. *Anal Bioanal Chem Epub* ahead of print. Doi:10.1007/s00216-015-8918-5. PMID:26255293

Vasylieva N, Ahn KC, Barnych B, Gee SJ, **Hammock BD**. 2015. Development of an immunoassay for the detection of the phenylpyrazole insecticide fipronil. *Environ. Sci. Technol*. 49:10038-10047. PMID: 26196357

Wang J, Majkova Z, Bever CRS, Yang J, Gee SJ, J. Li, T. Xu, **Hammock BD**. 2015. One-step immunoassay for tetrabromobisphenol A using a camelid single domain antibody-alkaline phosphatase fusion protein. *Anal Chem*. 87(9):4741-48. PMID:PMC4476793

Last

Linderholm, AL, Franzi LM, Bein KJ, Pinkerton KE, **Last JA**. 2015. A quantitative comparison of administration of coarse PM intranasally and intratracheally in the mouse. *Integrative Pharmacology, Toxicology and Genotoxicology*, 1(1):2-7.

Franzi LM, Linderholm AL, Rabowsky M, **Last JA**. Under review. Lung toxicity in mice of airborne particulate matter from a modern layer hen facility containing Proposition 2-compliant animal caging. *Toxicology and Industrial Health*.

Zeki AA, Bratt JM, Chang KY, Franzi LM, Ott S, Silveria M, Fiehn O, **Last JA**, Kenyon NJ. 2015. Intratracheal instillation of Pravastatin for the treatment of murine allergic asthma: A lung-targeted approach to deliver statins. *Physiological Reports*, 3(5), 2015, e12352. PMID: 25969462 PMID: PMC4463814

Leigh

Leigh JP, Du J, McCurdy SA. 2014. How much does the US government undercount nonfatal occupational injuries and illnesses in agriculture? *Annals of Epidemiology*. 24 (4): 254-259.

Leigh JP, Du J. 2015. Effects of wages on smoking decisions of current and past smokers. *Annals of Epidemiology*. 25 (8) : 575-582.

Chung Y-K, **Leigh JP**. 2015. Medicaid use by documented and undocumented farm workers. *Journal of Occupational and Environmental Medicine*. 57 (3) : 329 – 333.

Leigh JP, Medel-Herrero A. In press. Participation in the Women, Infants, and Children (WIC) program by documented and undocumented farm worker households. *Journal of Agromedicine*.

McCurdy

Xiao H, Stoecklin-Marois M, Li CS, **McCurdy SA**, Schenker MB. 2015. Cohort study of physical activity and injury among Latino farm workers. *American Journal of Industrial Medicine*. 58 (7); 737-745.

Schenker MB, **McCurdy SA**, Riden HE, Villarejo, D. 2015. Improving the health of agricultural workers and their families in California: Current status and policy recommendations. University of California Global Health Institute. 1-26.

Pinkerton and Bein

Plummer LE, Carosino CM, **Bein KJ**, Zhao Y, Willits N, Smiley-Jewell S, Wexler AS, **Pinkerton KE**. 2015. Pulmonary inflammatory effects of source-oriented particulate matter from California's San Joaquin Valley. *Atmospheric Environment*. In press (October 2015, volume 119).

Carosino CM, **Bein KJ**, Plummer LE, Castañeda AR, Zhao Y, Wexler AS, **Pinkerton KE**. 2015. Allergic airway inflammation is differentially exacerbated by daytime and nighttime ultrafine and submicron fine ambient particles: heme oxygenase-1 as an indicator of PM-mediated allergic inflammation. *J Toxicol Environ Health A*. 78(4):254-66. PubMed PMID: 25679046.

Van Winkle LS, **Bein K**, Anderson D, **Pinkerton KE**, Tablin F, Wilson D, Wexler AS. 2015. Biological dose response to PM_{2.5}: effect of particle extraction method on platelet and lung responses. *Toxicol Sci*. 143(2):349-59. PubMed PMID: 25389146; PubMed Central PMCID: PMC4306718.

Bein KJ, Wexler AS. 2015. Compositional variance in extracted particulate matter using different filter extraction techniques. *Atmospheric Environment*. 107, 24-34.

Linderholm, AL, Franzi LM, **Bein KJ**, **Pinkerton KE**, Last JA. 2015. A quantitative comparison of administration of coarse PM intranasally and intratracheally in the mouse. *Integrative Pharmacology, Toxicology and Genotoxicology*, 1(1):2-7.

Madl AK, Kadir T, **Pinkerton KE**, 2015. Particle Toxicities, Reference Module in Biomedical Sciences. Elsevier. doi: 10.1016/B978-0-12-801238-3.02084-5

Charrier JG, Richards-Henderson NK, **Bein KJ**, McFall AS, Wexler AS, Anastasio C. 2015. Oxidant production from source-oriented particulate matter - Part 1: Oxidative potential using the dithiothreitol (DTT) assay. *Atmospheric Chemistry and Physics*. 15(5), 2327-2340.

Ewart GW, Rom WN, Braman SS, **Pinkerton KE**. 2015. From closing the atmospheric ozone hole to reducing climate change Lessons learned. *Ann Am Thorac Soc*. 12(2):247-51. PubMed PMID: 25706493.

Li X, Xue M, Raabe OG, Aaron HL, Eisen EA, Evans JE, Hayes FA, Inaga S, Tagmout A, Takeuchi M, Vulpe C, Zink JI, Risbud SH, **Pinkerton KE**. 2015. Aerosol droplet delivery of mesoporous silica nanoparticles: A strategy for respiratory-based therapeutics. *Nanomedicine* 11:1377-1385. doi: 10.1016/j.nano.2015.03.007. PMID:25819886.

Pinkerton KE, Harbaugh M, Han MK, Jourdan Le Saux C, Van Winkle LS, Martin WJ 2nd, Kosgei RJ, Carter EJ, Sitkin N, Smiley-Jewell SM, George M. Women and lung disease. Sex differences and global health disparities. *Am J Respir Crit Care Med*. 2015 Jul 1;192(1):11-6. doi: 10.1164/rccm.201409-1740PP. Review. PMID: 25945507

Schenker

Moyce SC, Tancredi DJ, Joseph JG, Mitchell DC, and **Schenker MB**. Submitted August 2015 to JOEM. Cumulative incidence of acute kidney injury in California's agricultural workers.

Courville, MD, Wadsworth, G and **Schenker MB**. Submitted August 2015 to J. Ag Food Systems and Community Development. "We just have to continue working": Farmworker self-care and heat related illness.

Mitchell DC, Arteaga VE, Armitage TL, Mitloehner FM, Tancredi DJ, Kenyon NJ, **Schenker MB**. 2015. Cage versus noncage laying-hen housings: Worker respiratory health. *Journal of Agromedicine*. Aug 3 [Published online].

Xiao H, Stoecklin-Marois M, Li CS, McCurdy SA, **Schenker MB**. 2015. Cohort study of physical activity and injury among Latino farm workers. *American Journal of Industrial Medicine*. 58 (7); 737-745.

Schenker MB, McCurdy SA, Riden HE, Villarejo, D. 2015. Improving the health of agricultural workers and their families in California: Current status and policy recommendations. University of California Global Health Institute. 1-26.

Stoecklin-Marois MT, Bigham CW, Bennett D, Tancredi DJ, **Schenker MB**. 2015. Occupational exposures and migration factors associated with respiratory health in California Latino farm workers: The MICASA Study. *Journal of Occupational and Environmental Medicine*. 57(2); 152-158.

Mitchell DC, Armitage TL, **Schenker MB**, Bennett DH, Tancredi DJ, Langer CE, Reynolds SJ, Dooley G, Mehaffy J, Mitloehner FM. 2015. Particulate matter, endotoxin, and worker respiratory health on large Californian dairies. *Journal of Occupational and Environmental Medicine*. 57(1); 79-87.

Schenker MB. 2014. Human trafficking for forced labour and occupational health. Occupational and Environmental Medicine. Sep 26 [Published online].

Rodriguez EJ, **Schenker MB**, Stoecklin-Marois MT, Bennett DH, Tancredi DJ. 2014. Agricultural work exposures and pulmonary function among hired farm workers in California (the MICASA study). Journal of Agromedicine. 19(4); 427-436

Presentations

Castañeda, A. R.

Castañeda, A. R., K.J. Bein, C.F. Vogel, and K. E. Pinkerton. Particulate matter enhances the pulmonary allergic immune response to house dust mite in a BALB/c mouse model. Poster session presented at: the Sixth Annual UC Davis Lung Day; 2015 June 19; Davis, CA.

Castañeda, A. R. and K. E. Pinkerton. Air Quality and Health Effects: A Focus on Asthma. Oral session presented at: the UC Davis John Muir Institute of the Environment, White Family Graduate Student Award Program Symposium; 2015 May 29; Davis, CA.

Castañeda, A. R., K.J. Bein, C.F. Vogel, and K. E. Pinkerton. Particulate matter enhances the pulmonary allergic immune response to house dust mite in a BALB/c mouse model. Poster session presented at: the UC Davis Campus-wide Interdisciplinary Graduate Student Symposium; 2015 Apr 2-3; Davis, CA.

Castañeda, A. R., K.J. Bein, C.F. Vogel, and K. E. Pinkerton. Particulate matter enhances the pulmonary allergic immune response to house dust mite in a BALB/c mouse model. Poster session presented at: the Society of Toxicology Annual Conference; 2015 Mar 22-26; San Diego, CA

Castañeda, A. R., K.J. Bein, C.F. Vogel, and K. E. Pinkerton. Particulate matter enhances the pulmonary allergic immune response. Poster session presented at: the Immunology Graduate Group Retreat; 2015 Feb 20-21; Davis, CA.

Fathallah

“Orchard Ladders with Shorter Rung Spacing for Stone Fruit Harvest.” 19th International Ergonomics Triennial Congress. Melbourne, Australia, August 9-15, 2015.

“California AgrAbility: Finding Solutions for California Agricultural Communities.” ASABE CA/NV Section Meeting, Tulare, CA, February 11, 2015.

“Agricultural Ergonomics: Perspectives from California and elsewhere.” Invited Keynote Speaker, 17th Brazilian Ergonomics Congress, Sao Carlos, Brazil, September 15-18, 2014

“Agricultural Ergonomics in California.” American University of Beirut Faculty of Health Sciences. September 13, 2014 and September 17, 2015.

Hammock

“Immunoassays for small molecules that use novel single domain antibodies derived from camelids (VHH) in place of classical IgG antibodies” Superfund Research Program Annual Meeting, November 12, 2014, San Jose, CA. Oral presentation.

“Nanobody-based immunosensors for the sensitive and selective detection of BDE-47” Superfund Research Program Annual Meeting, November 12, 2014, San Jose, CA. Poster presentation.

“Glycolipid biosurfactants enhance degradation of aromatic pollutants. 2014 Joint Annual Meeting of Society for Glycobiology and Japanese Society of Carbohydrate Research. November 16-19. Honolulu, Hawaii

“Immunoassays for environmental contaminants using single domain heavy chain antibodies (VHH)”. 250th American Chemical Society Meeting, August 16-20, 2015, Boston, MA. Oral presentation

“Biomonitoring of pyrethroid exposure in Thai farmers and consumers by immunoassay”. 250th American Chemical Society Meeting, August 16-20, 2015, Boston, MA. Oral presentation
“Phage display based nanobodies and peptides in analysis of environmental chemicals by immunoassay. 250th American Chemical Society Meeting, August 16-20, 2015, Boston, MA. Poster presentation.

Leigh

“California’s nurse-to-patient ratio law and occupational injuries.” UC Davis. April 17, 2015

Moyce, S.

Moyce, S. (2015). “Incidence of Acute Kidney Injury in California’s agricultural workers.” University of California, Summer Institute on Migration and Health. Oakland, CA.

Moyce, S. (2015). “Kidney Function in California’s agricultural workers.” Sociology: Immigration and Opportunity. University of California, Davis.

Schenker, M., Moyce, S., Vega, A. (2015). “Climate change and occupational heat stress.” Climate change and health. University of California, Berkeley.

Moyce, S. (2014). “Heat exposure, dehydration, and kidney function in California’s agricultural workers.” Center for Occupational and Environmental Health Annual Meeting, Davis, CA.

Schenker

Presentations on heat illness prevention and the current study were made to 4 groups of supervisors attending the 'Train the Trainer' workshops (approximately 100 people) in the spring of 2015. The locations included Davis, Los Angeles, Fresno and Napa Valley. Two special Heat Illness Prevention trainings were conducted by Teresa Andrews in San Bernadino and Fresno reaching about 30 supervisors and workers.

"Occupational Health Panel," Guest Speaker, Binational Policy Forum on Migration and Global Health, San Luis Potosi, Mexico, October 6, 2014.

"Migration and Health: Latinos," Guest Speaker, 12th Annual UCDPHSA Pre-Medical and Pre-Health Professions National Conference, UC Davis, October 11-12, 2014.

"The Intersection of Immigration and Agricultural Work on Farmworker Health," Keynote Speaker, 7th International Symposium on Safety and Health in Agricultural and Rural Populations: Global Perspectives (SHARP), Saskatoon, Saskatchewan, Canada, October 19-22, 2014.

"Respiratory Health: Animal Exposures and Beyond," Abstract Presenter, 7th International Symposium on Safety and Health in Agricultural and Rural Populations: Global Perspectives (SHARP), Saskatoon, Saskatchewan, Canada, October 19-22, 2014.

"Occupational Disease," SPH 262, Guest Lecturer, University of California Davis, Davis, California, October 24, 2014.

"Occupational Health for Diverse Worker Populations," Guest Lecturer (Webex), Occupational and Environmental Health Nursing, University of California San Francisco, San Francisco, California, November 12, 2014.

"Global Health Disparities of Immigrants and other Vulnerable Workers," Guest Lecturer, Global Health Equity Lecture Series, Center for Global Health and the Global Health Residency Program, University of Pittsburgh Graduate School of Public Health, Pittsburg, Pennsylvania, November 10, 2014.

"Occupational Health of Immigrants and Other Vulnerable Workers," Guest Lecturer, Guest Speaker, Environmental and Occupational Health Sciences Research Seminar Series, School of Public Health, University of Texas, Houston, Texas, November 21, 2014.

"Epidemiologic research where it is needed most: Immigrants and other underserved populations," Graduate Group in Epidemiology Seminar, Guest Lecturer, University of California, Davis, California, January 26, 2015.

“Engaging Community Partners in addressing migrant health issues,” Community Development Seminar Class, Guest Lecturer, University of California, Davis, California, January 28, 2015.

“Shining a Light on Occupational Health Among Immigrant and Other Disadvantaged Populations,” Guest Lecturer, McAuley Lecture, School of Nursing and Health Studies, Georgetown University, Washington D.C., February 23, 2015.

“Occupational health disparities of immigrant,” Guest Speaker, Environmental Health Sciences Seminar, Department of Environmental Health Sciences and Risk Science Center, University of Michigan, Ann Arbor, MI, February 27, 2015.

“Improving the Occupational Health of Immigrant Workers: a Global Challenge,” Hadassah Medical Center, Hebrew University School of Public Health, Ein Kerem Jerusalem, Israel, March 23, 2015.

“Occupational Health of Immigrant Workers and Other Underserved Populations,” Guest Speaker, Environmental Health Seminar Series, University of Washington School of Public Health, Seattle, WA, April 8, 2015.

“Future of Occupational Health,” Guest Speaker, Environmental Health Seminar Series, University of Washington School of Public Health, Seattle, WA, April 8, 2015

“Agriculture Hazards And Its Impacts On Migrant Farmworkers,” Guest Speaker, University of Nevada Reno, Reno, NV April 29, 2015

“Heat Stress Among Agricultural Workers: An Underappreciated Risk of Climate Change,” Guest Speaker, University of California Berkeley, School of Public Health, Berkeley, CA April 30, 2015

“Infectious Disease and Occupational Health among Immigrants” SPH 212, Guest Lecturer, University of California Davis, Davis, California, May 12, 2015

“Occupational health disparities among immigrant workers” International Seminar on Migrant workers in Agriculture, Swedish University of Agricultural Sciences, Alnarp, Sweden, May 26, 2015

“Perspective on Migration and Health” 10th Summer Institute on Migration and Global Health, The California Endowment Conference Center, Oakland, CA, June 22, 2015

“Case Control Study,” Clinical Epidemiology, Guest Lecturer, UC Davis, Sacramento, California, July 6, 2015.

“Methods to Survey a Difficult to Reach Population of Immigrant Farmworkers” Sociedad Espanola De Epidemiologia (SEE) II Congress of Epidemiology and Public Health, Santiago de Compostela, Spain, September 2-4, 2015