



PACIFIC NORTHWEST AGRICULTURAL SAFETY & HEALTH CENTER

RESEARCH FOR

Healthy Workers, Strong Communities & Productive Agriculture

YEAR END REPORT

Fiscal Year 2013

(September 30, 2012 to September 29, 2013)

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Submitted by:

Richard Fenske, PhD, MPH, Professor and Center Director
rfenske@u.washington.edu

Pacific Northwest Agricultural Safety and Health Center
depts.washington.edu/pnash/

Department of Environmental and Occupational Health Sciences
School of Public Health
University of Washington



PNASH YEAR END REPORT FY2013

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PNASH FY2013 - INTRODUCTION

The PNASH Center conducts research and promotes best occupational health and safety practices for Northwest farming, fishing and forestry industries. Our goal is to prevent or reduce injury and illness for producers, workers, and their families.

PNASH's tagline, newly composed by the PNASH Team, speaks to our mission and commitment:



One of ten regional centers, PNASH works throughout the Northwest integrating expertise from multiple disciplines, institutions and community partners. We are housed in the UW School of Public Health and have formal affiliations with multiple UW programs, Washington State University (WSU), and Oregon State University, among others. Our faculty, staff, and students bring expertise to our agricultural industries in the fields of medicine, nursing, industrial hygiene, epidemiology, engineering, and education.

Principal funding of the PNASH Center is granted through the Agricultural, Forestry and Fishing (AgFF) Program at the National Institute for Occupational Safety and Health (NIOSH)/Centers for Disease Control and Prevention. The NIOSH AgFF program is a non-regulatory approach that addresses region- and industry-specific complexities. The PNASH Center began under this program in 1996, and in 2011 we started the current awarded 5-year program cycle. PNASH is also competitively awarded project grants from other federal, state, and non-profit organizations.



Relevance

The three agricultural industries (farming, fishing, and forestry) consistently rank among the most dangerous jobs, with fatality rates 7-8 times that of the all-industry average for the US. Commercial fishing fatality rates exceed national averages for all occupations 60-fold, and logging fatality rates exceed the national average by 20 times. Farming is a unique workplace in that families frequently live on site. Each year 5,800 children are reported injured and 100 are killed on US farms.

Agricultural injury statistics often do not include the men, women, and youths at operations with fewer than 11 full-time employees. Nearly 78% employers fall into this category, even though the AgFF industry as a whole constitutes one of the largest industry sectors in the US. In addition to injuries and fatalities, agricultural, forestry and fishing workers are also at high risk for illnesses such as lung diseases, hearing loss, heat related illness, skin diseases and certain cancers associated with chemical use and prolonged sun exposure.

The economic burden in a single year is assessed at a 8.3 billion loss in productivity

Second Year (FY2013) Activities

This report's focus is on high impact activities and accomplishments for PNASH's new five-year program cycle. Our second year saw progress across all projects, the conclusion of four pilot projects, and the funding of four new emerging areas.

PNASH Internal Advisory Committee

Name	Role	Phone	email
Richard Fenske, PhD, MPH	Director	206-616-1958	rfenske@uw.edu
Michael Yost, PhD	Co-Director	206-616-1958	airion@uw.edu
Marcy Harrington, MPA	Center Manager	206-685-8962	marcyw@uw.edu
Victoria Breckwich Vásquez, DrPH	Director of Community Engagement & Education	206-616-5906	vbreck@uw.edu
Catherine Karr, MD, PhD	Internal Advisory Committee	206-616-1958	ckarr@uw.edu
Christopher Simpson, PhD	Internal Advisory Committee	206-616-1958	simpson1@uw.edu



PNASH FY2013 - ALL ACTIVE PROJECTS

RESEARCH

Res 1: Farmworker OP Exposure through Protein Adducts, PI: Christopher Simpson (NIOSH 2011-2016)

Res 2: IPM to Reduce Pyrethroid Pesticide Exposures in Dairy Workers, PI: Michael Yost (NIOSH 2011-2016)

Feas 4: Parkinsonism among Washington State Agricultural Pesticide Handlers

PI: Harvey Checkoway (PNASH Small Grant 2012-2014)

Feas 7: Transmission of Microorganisms in Dairy Farms, PI: Peter Rabinowitz (PNASH Small Grant 2013-2014)

Feas 6: Fishing Industry Filipino Migrant & Immigrant Work, PI: Gabriel Garcia (PNASH Small Grant 2013-2014)

Development of a Surveillance Strategy to Guide Injury Prevention Efforts in the Washington Commercial Fishing Industry, PI: June Spector (MAAF 2012-2014)

Feas 1: Development of a Work Stress Survey for Farmworkers, PI: Diane Rohlman (PNASH Small Grant 2011-2014)

Res 4 Pilot: Risk Factors for Heat-Related Illness in Agricultural Workers in Washington

PI: June Spector (NIOSH 2011-2013)

Feas 3: Risk Factors for Heat-Related Illness among Oregon Farmworkers,

PI: Jeffery Bethel (PNASH Small Grant 2012-2013)

PREVENTION & INTERVENTION

Prev 1: Reducing Agricultural Worker Risks through New and Emerging Technologies

PI: Richard Fenske (NIOSH 2011-2016, MAAF 2012-2013)

Prev 2: Ergonomic Evaluation and Development of Best Practices for the Use of Mobile Work Platform Technology in Orchards, PI: Peter Johnson (WA State MAAF 2009-2011, NIOSH 2011-2016)

Improving PPE Effectiveness in Agricultural Applications, PI: Michael Yost (MAAF 2012-2014)

Prev 3 Pilot: Assessing Agricultural Safety and Health among Hmong Farmers

PI: Arnold de Castro (NIOSH 2011-2013)

EDUCATION

Edu 1: Pesticide Safety in Tree Fruit: Translating Research, Overcoming Barriers

PI: Nadine Lehrer & Kit Galvin (NIOSH 2011-2016)

Video For Farmworker Ladder Safety & Heat Illness Prevention, PI: Richard Fenske (MAAF 2012-2014)

Feas 5: GRAS²P Food Safety Video, PI: Nichole Brunner (PNASH Small Grant 2013-2014)

Feas 2: Reducing Occupational Health and Safety Risks among Young Workers in Agriculture through Clinician Engagement, PI: Catherine Karr (PNASH Small Grant 2011-2013)

COMMUNITY-BASED PARTICIPATORY RESEARCH

El Proyecto Bienestar (or Well Being Project, a partnership of UW PNASH; Northwest Communities Education Center/Radio KDNA; Heritage University; Yakima Valley Farm Workers Clinic. Our current Bienestar projects:

Aggravating Factors of Asthma in a Rural Environment, PI: Catherine Karr (NIH&CDC 2009-2014)

Health & Safety of Women Ag Workers in Yakima Valley – Sexual Harassment, PI: Catherine Karr (MAAF 2013-2014)



PNASH FY2013 ACCOMPLISHMENTS

Core Programs

Administration, Evaluation and Outreach

ADMINISTRATIVE AND PLANNING

The Administrative and Planning Core provides an infrastructure for the Center and assists in the implementation of individual project and program objectives. Core programs ensure that activities are well coordinated and integrated within the center, are of high scientific quality, meet their objectives, and work in coordination with community and industry partners to move results into practice.

Changes in Personnel Dr. Victoria Breckwich Vásquez joined PNASH in September 2012 as Director of Community Engagement & Education. Dr. Breckwich Vásquez has worked extensively in public and community health both in the US and Latin America. She brings an exceptional background in community-based research, evaluation, and strategic planning. In FY2013 she led a stakeholder needs assessment and action plan, and forged new partnerships in the region in the areas of student mentoring, pesticide handler education, community health worker programs, and workplace sexual harassment.

Student Mentorship FY2013 brought in new opportunities for student participation in PNASH research through teaching assistantships and internships. New this year, we established a cooperative agreement with the UW College Assistance Migrant Program (CAMP), a unique program offering children of migrant and seasonal farm working families academic support and experiences. CAMP student participation has enhanced PNASH greatly. For more information on the PNASH CAMP internship, see the Seattle Times article: **Doors open for migrant students to attend and succeed at UW:** http://seattletimes.com/html/localnews/2011838817_campuwxml.html

PNASH FY2013 Students

Jane Pouzou, Pesticide tech project RA (UW PhD Student)

Eddie Kasner, Pesticide notification project RA (UW PhD Student)

Hannah Frankel, Fishing project intern (UW undergraduate)

Michelle Lam, Heat illness medical student intern
(UW medical student)

Theresa Bordianu, OP Adducts intern (UW undergraduate)

Anna Fretheim, Academic Year Student Intern
(UW undergraduate)

Elizabeth Ambriz, Skagit community survey intern
(UW graduate student)

Carly Miller, Fishing project summer intern at NIOSH AK Regional Office (UW graduate student)

Nohely Díaz, CAMP Program, PNASH Summer Intern (UW undergraduate)

Jose Carmona, CAMP Program, PNASH Summer Intern (UW undergraduate)

Brenda Nuñez - CAMP Program, Changing the Climate Conversation (UW undergraduate)

Carmen Ruby Torres - CAMP Program, Changing the Climate Conversation (UW undergraduate)

Sarra Tekola – UNCF Merck Fellow and Undergraduate Science Research Scholar, Changing the Climate Conversation (UW undergraduate)

Six additional students contributed from external partner institutions

Interns in the field on Dairy IPM Project



New Projects Grant Awards Each year, thanks to a nucleus of research expertise and support formed by the Center, our faculty and staff researchers successfully procure additional project grants to help advance the goals and priorities of the PNASH Center. In FY2013 the following projects addressing PNASH's mission were awarded:

Health & Safety of Women Agricultural Workers in Yakima Valley – Sexual Harassment

PI: Catherine Karr. Funder: Washington Medical Aid and Accident Fund

Notification of Pesticide Applications to Minimize Workplace Exposure

PI: Richard Fenske. Funder: Washington Medical Aid and Accident Fund

Prevent and Reduce Adverse Health Effects of Pesticides on Indigenous Farmworkers

PI: Nargess Shadbeh. National Institute on Minority Health and Health Disparities award to Oregon Law Center.

Changing the Climate Conversation PI: Richard Fenske. Funder: UW School of Public Health.

SMALL GRANT (PILOT/FEASIBILITY) AND EMERGING ISSUES PROGRAM

Every year PNASH sends out a call to Northwest investigators for pilot research or small projects in ag safety and health. We are pleased to announce this year's awards for small grants for 2013-2014:

GRAS2P Food Safety Video PI: Nicole Brunner, WA Horticultural Association

This video project will integrate current pesticide safety standards into the video: Fieldworker Orientation and Food Safety Orientation/Orientation para el Trabajador Agrícola y Seguridad Alimenticia. The current version of this bilingual video is used by growers and workers in WA and across the US to ensure effective food safety practices. This product is being iteratively developed by the Washington State Horticultural Association and local partners under the program GRAS²P (Growers Response to Agriculture, Safe and Sustainable Practices).

Transmission of Microorganisms in Dairy Farms PI: Peter Rabinowitz, UW DEOHS

Dairy farming requires close contact between people and animals with transmissions that can be a source of zoonotic disease. In this small pilot, a multidisciplinary team will survey work practices to provide insight into modifiable risk factors for microbial transmission with implications for the health of workers, dairy cows and the environment in a "One Health" model.

Fishing Industry Filipino Migrant and Immigrant Work PI: Gabriel Garcia, U of AK

Filipino migrants and immigrants are the dominant racial/ethnic workforce in fish processing in Unalaska/Dutch Harbor, Alaska, composing 28% of the total resident population. University of Alaska and Washington investigators will conduct in-depth interviews to understand the unique injury risk factors and health behaviors affecting this vital workforce.

EVALUATION PROGRAM

PNASH's Evaluation Program's goal is to ensure that our efforts are relevant, feasible, sustainable, the best science and practice, and demonstrate efforts consistent with the ultimate goal of reducing injuries and illness. The program focuses at the micro project level and at the macro Center level. On an annual basis, PNASH internally assesses progress and impacts while an external review is conducted by our Scientific Advisory Committee. In FY2013 we redeveloped our **Program Monitoring Database** into a new relational database with a web-hosted platform. PNASH Center personnel were trained in evaluation methods and the resulting database will be introduced to NIOSH/Ag Centers for their potential use.

PNASH also collaborated in a planning process for cross-center evaluation and enhanced intra-extramural dialogue with the NIOSH Ag Centers and NIOSH program offices. A working group shared evaluation methods and identified needs for future coordinated performance and impact monitoring. Workshops took place with Center evaluators and leadership on October 24, 2102 hosted at Minneapolis Center, April 15, 2013 hosted at Colorado Center and at the NIOSH Extramural Center Director's Meeting October 3-4, 2013 in Colorado. An independent review in FY2012 of the NIOSH Agricultural, Forestry, and Fishing (AgFF) program has found it to be highly relevant to improvements in workplace safety and a proven contributor to workers' well-being and health, finding that "Research has been in very high priority areas and is highly relevant to improvements in workplace [safety and health] protection."

OUTREACH AND EDUCATION PROGRAM

The Agricultural Community Outreach and Education Program (ACOEP) is the Center's foundation for building relationships and sharing information with our agricultural community. Dr. Victoria Breckwich Vásquez began her position as Director of Community Engagement & Education in September 2012.

Stakeholder Needs Assessment

Dr. Breckwich Vásquez collaborated with Center leadership and advisors to conduct a stakeholder needs assessment. Through personal semi-structured interviews with 39 key partners and stakeholders Dr. Breckwich Vasquez learned about our external engagement impacts and challenges, and shared this information with PNASH staff at a series of internal workshops. In response, PNASH has moved forward with an action plan to enhance Center communication strategies.

"I have enjoyed being a part of research with PNASH and feel our joint work has resulted in positive impacts in the community. There are exciting opportunities to continue working together, especially given the enormous need that exists."
– PNASH Stakeholder

Oregon Farming, Fishing and Forestry Partner Meetings

In May and October, a unique outreach effort was made to engage potential partners in Oregon. Meetings were organized with local investigators/champions to learn about Oregon-specific partnerships and issues, and to explore specific emerging opportunities. The commitment and work of these partners was impressive and we hope to create new collaborations as the Center moves toward a new 5-year program cycle.

Salud at Tuality Health Care & Vineyard Tour, Hillsboro, OR
US Coast Guard AMSEA Drill Conductor Course, Astoria, OR
Oregon State University Sea Grant, Newport, OR
Oregon State University College of Public Health, Corvallis, OR
OR OSHA and PARC Team (pesticide illness monitoring), Salem, OR
SAIF, Salem, OR (Private Non-Profit Workers Comp. Insurer) & **OYES** (Oregon Young Employees)
Oregon Institute of Occupational Health Sciences, Oregon Health and Science University, Portland, OR
Portland State Univ, Oregon Law Center, Pineros y Campesinos Unidos Noroeste (PCUN), Portland, OR
OR OSHA Logging Code Committee, Salem, OR (and field tour to logging site). Representatives from OR OSHA, Association of Oregon Loggers and various logging and forest service contract companies.
Northwest Forest Worker Center, Promotoras de Salud, Ashland, OR
Lomakatsi Restoration Project (and field tour), Ashland, OR

Analysis of Community Health Survey in Skagit/Whatcom Counties

We collaborated with Sea Mar Community Health Center's promotores program to establish the analytical design for an annual community health survey conducted in Whatcom and Skagit County labor camps. With guidance from Paul Sampson, PNASH's faculty statistician, MPH student intern Elizabeth Ambríz developed the analytical approach and provided a detailed descriptive analysis of findings from the 2012 Community Health Survey to Sea Mar.

Sponsored Education and Outreach

Communities at Risk: Linking science with communities to address environmental and occupational health concerns. Workshop at the Society for the Advancement of Hispanics/Chicanos and Native Americans in Science. Seattle, WA: October 13, 2012.

Washington Governor's Ag Safety Day Wenatchee, WA: February 22, 2013. PNASH was a lead sponsor for the following presentations: Cultural Humility (ENG/SP), Tips and Tools for Training & Confined Space (ENG/SP), Practical Solutions for Pesticide Safety (ENG/SP) In conjunction, PNASH Health Fair with educational tables/booths: Fluorescent Tracer Demos, Practical Solutions for Pesticide Safety, Health Illness Risk, Musculoskeletal Risks and Prototype Apple/Cherry Bags, Pesticide Lotería Game, Tuberculosis Risk, and Information on the 2013 healthcare system.



Pesticide Applicator Recertification Training with Washington State Department of Agriculture

The PNASH outreach director (Dr. Breckwich-Vasquez) was trained by the Washington State Department of Agriculture (WSDA) to provide Hands-On Training to Spanish-speaking pesticide handlers and agricultural workers throughout Washington State as part of the Farmworker Education Program. PNASH participated in six trainings and trained 310 workers on respirators, PPE, decontamination, and mixing and loading. An extra training during the season was made possible due to PNASH training support. In addition, these educational opportunities were used for research program recruitment, Center-prioritized prevention messages, and research translation.

"Seguridad en el Campo: Como mantenerse sano y salvo trabajando en el campo"

A Spanish-language radio show (KSVR 91.7FM) on agricultural worker health and safety was broadcast in Skagit County for Sea Mar Community Health Centers, in collaboration with the Washington State Department of Labor and Industries. The show (30 min) was estimated to reach 15,000 Spanish-speakers in Skagit and Whatcom Counties. A radio interview guide was produced with local agricultural injury data, and included key talking points on prevention steps, as well as information on local/state resources for workers.

PNASH Center Stakeholder Education and Communications

Through our combined education programs, we directly reached approximately 2,400 individuals in Washington and Oregon in the FY2013. PNASH enhanced its mass communications approach, releasing a monthly E-newsletter to over 700 PNASH stakeholders who have been added at their request to our mailings and news lists over the years. Our Center website was accessed by 6,516 unique visitors, with the top visited pages being our educational websites: Northwest Forest Worker Safety Review (newsletter) and Heat Related Illness. The PNASH communications team reviewed mass media and social network options, reestablished our priority approaches and will be launching new social media approaches in the coming year.

NEW DIRECTIONS - Washington Leaders for Conversations about Climate

This project uses a student/local champion and community-based participatory research model to launch conversations in rural parts of WA state on the complex topic of climate change. The goal of these inter-generational teams was to develop a local understanding of the science and issues, including impacts specific to their communities. Five undergraduate students were trained and mentored, working as a team and within their own home communities - four distinct rural counties in Washington State. The student leaders are from under-represented minority and migrant farmworker family backgrounds. The students learned about climate change research, conducted community needs assessments, identified a community leader and developed a volunteer base to join them on this project. Now underway are public community education forums in three Hispanic farmworker communities and one mixed rural/urban community, and development of Spanish language public education materials.

NEW DIRECTIONS – El Proyecto Bienestar and Sexual Harrassment (or, Well Being Project) is a long-standing community based participatory research project and partnership between the UW PNASH Center, Northwest Communities Education Center/Radio KDNA, Heritage University, and the Yakima Valley Farm Workers Clinic. In FY2013 El Proyecto Bienestar (EPB) was reinvigorated with the introduction of a new community advisory board (CAB). PNASH's role was facilitating a program review and strategic planning process through personal interviews and CAB meetings. EPB's most important new direction responds to a community priority of workplace abuse: **Health & Safety of Women Ag Workers – Sexual Harrassment**, was proposed by PNASH in partnership with EPB and funded through the WA State Medical Aid and Accident Fund. EPB partners will address a local and national issue of importance – sexual harassment of women working in agriculture. Our partnership, along with a community advisory board, will assess the extent of and interrelationship between sexual harassment and worker health and will then develop, deliver and evaluate an educational program focused on prevention for the Yakima Valley ag industry, including workers, managers and growers.



PNASH FY2013 ACCOMPLISHMENTS

Research Project Activities

Research for Intervention, Prevention and Education

PROJECTS COMPLETED FY2013

Prev 3 (Pilot): Assessing Agricultural Safety and Health among Hmong Farmers (NIOSH 2011-2013)



Hmong refugees are increasingly being resettled throughout the U.S., and are frequently engaging in small, family-owned farm operations. This pilot project was important in taking a preliminary, foundational step towards fully investigating agricultural work hazards among refugees operating small-scale farms. Considering the significant challenges that refugees endure during the resettlement process, examining how life circumstances, in particular work, determine health status during this transition is a worthwhile undertaking. Working in a partnership with Washington State University's (WSU) Small Farm Program, we assessed safety and health issues among Hmong refugee farmers in Washington State. The project explored novel participatory approaches: the participatory rural appraisal process as well as integrated Photovoice and

farm worksite observational exposure assessments. Additionally, we successfully established a working relationship with the Hmong community in the Skagit Valley. This is a regional stakeholder group that PNASH had not engaged previously. Our findings are in press and available for use is a Facilitator's Participatory Rural Appraisal Guide.

Publication

R Neitzel, J Krenz, A de Castro. Safety and health hazard observations in Hmong farming operations. *J Agromedicine*. (Accepted 2014).

Res 4 (Pilot): Study of Risk Factors for Heat-Related Illness in Agricultural Workers (NIOSH 2011-2013)

This two-year pilot, completed in FY2013, successfully generated baseline data and set the stage for future study of the association between potential Heat Related Illness (HRI) risk factors and heat effects as well as the development of interventions to reduce HRI. Heat exposure has been identified as an important cause of non-fatal illness and death in agricultural workers. Few studies have focused on HRI in hired crop workers, who are largely seasonal, foreign-born, Spanish-speaking workers. There is currently little known about how cultural beliefs and practices related to hydration and HRI may affect the prevention and treatment of HRI in these workers.

The overall goal of this study was to identify potential risk factors for HRI and to determine the feasibility of quantifying the physiological effects of heat exposure in agricultural workers. To accomplish our aims, we:

1) conducted Participatory Rural Appraisal (PRA) workshops to engage our study population and facilitate identification of cultural beliefs and practices that may pose barriers to HRI prevention; 2) developed and validated an interactive computer-based survey instrument to characterize potential HRI risk factors; and 3) measured heat exposure and heat strain in a small sample of workers in the fields.

Major observations regarding farmworkers' HRI-relevant beliefs and attitudes included: 1) farmworkers subscribe to varying degrees to the belief that cooling treatments should be avoided after heat exposure, with some believing that such treatments should be avoided after heat exposure, and others encouraging the use of such treatments; 2) the desire to lose weight may be reflected in behaviors that promote increased sweating; 3) highly caffeinated energy drinks are preferred to increase work efficiency and maintain alertness; and 4) the location of drinking water at work

**"A traditional remedy for heat stress in my community is to drink strong coffee with lime. Now I know it makes it worse because of the caffeine."
– HRI workshop participant**

(e.g. next to restrooms) and whether water is clean, but not necessarily chemically-treated, are important considerations in deciding whether to drink the water provided at worksites. All findings are currently being published and incorporated into HRI educational materials. The resulting materials will be disseminated regionally to workers and employers through PNASH's Outreach and Education Core.

Further study of potential knowledge-behavior gaps may uncover opportunities for additional HRI prevention strategies. Farmworkers and employers should be included in the development and evaluation of interventions to prevent HRI. A KO1 (new investigator) project proposal has been submitted by Dr. June Spector to investigate the association between heat stress, injury risk, and productivity in agricultural workers. We are also exploring a new project integrating a heat alert for the agricultural community on Washington State University's Ag Weather Net website.

Publications

M Lam, J Krenz, P Palmández, M Negrete, M Perla, H Murphy-Robinson and JT Spector. Identification of barriers to the prevention and treatment of heat-related illness in Latino farmworkers using activity-oriented, participatory rural appraisal focus group methods. BMC Public Health 2013, 13:1004-1015.

See: <http://www.biomedcentral.com/1471-2458/13/1004>

Feasibility 3: Risk Factors for Heat-Related Illness among Oregon Farmworkers (PNASH Small Grant 2012-2013) Complementing our HRI pilot in Washington State, this one-year pilot conducted by Oregon State University (OSU) surveyed a farmworker community in Oregon, collaborating with our UW PNASH HRI project on the computer-based survey instrument. OSU researchers and students conducted personal interviews with 100 Latino migrant or seasonal workers engaging in outdoor crop production work during the data collection period. Nearly 30% of participants reported experiencing ≥ 2 HRI symptoms previous week. There was a low level of knowledge about working in the heat and concern about HRI, but moderate comfort level taking breaks. Nearly 75% drank water ≥ 1 x per hour, 65% consumed soda while working, and 40% worked at a site in which no cooling measures were provided (e.g. shade, trees, rest stations). Results from this study provide the foundation from which a culturally competent intervention can be developed to reduce the incidence of HRI. Results from the project demonstrate that heat-related illness is an important health topic for agricultural workers and that hydration and cooling measures need to be emphasized to workers as well as growers as a way to decrease heat-related illness.

Feasibility 2: Reducing Occupational Health and Safety Risks among Young Workers in Agriculture through Clinician Engagement (PNASH Small Grant 2011-2013) Occupational hazards for adolescent farmworkers is a topic many argue is critical, but for which there are few directed research activities. This small project introduced a rapid clinical assessment tool developed by the Migrant Clinicians Network to migrant health care providers. There were challenges in conducting research within a busy clinical setting and new, dynamic organizational changes. However, the involvement of the clinic staff in shaping the tools for this project was successful and the project was able to "field test" the Migrant Clinician Network Rapid Clinical Assessment Tool with the intended audience for the first time. In addition, the project yielded novel data to characterize the work hazard experience of young workers in agriculture. A community engaged approach trained fourteen undergraduate students in the topic and conduct of occupational health research including human subjects training, education on adolescent occupational health and safety issues, survey data analysis and preparation and delivery of results. One hundred forty community youth were surveyed regarding their occupational health perspectives. A manuscript of these findings is in preparation. This project has been a stepping stone for collaboration on research and translation projects between the PNASH and the regional clinical community.

"This study has opened my eyes to the actual general knowledge of the community, especially those of my generation. It gives a good insight as to how we can best educate students and their families on resources accessible to them. Not everyone is fortunate enough to have someone constantly caring about their well being."
– Leticia Campos, Student Intern

PROJECTS CONTINUING

Res 1: Measurement of Farmworker Exposure to OP Pesticides through Protein Adducts

(NIOSH 2011-2016, UW Royalty Research Fund 2012)



Organophosphorus (OP) pesticides cause illness through inhibition of cholinesterase, a critical enzyme in the nervous system. Our previous work developed an assay that provides greater sensitivity and specificity as compared to traditional cholinesterase monitoring – eliminating the need for collection of a baseline pre-exposure blood sample from each worker. We are expanding this assay to improve the understanding of worker exposures to a wide range of OP pesticides and developing it for use in field and clinic settings, providing rapid feedback to workers, clinicians, and physicians.

We have been very successful in developing the mass spectrometry based assays, and demonstrated the effectiveness of one of these in three populations with occupational exposure to OP pesticides. Further, we have begun to use these assays to identify risk factors associated with overexposure to OPs and susceptibility to the effects of OP exposure. Ultimately, utilization of these assays will help to ensure that workers are adequately protected against overexposure to OP pesticides and the associated adverse health outcomes.

FY2013 Accomplishments

- Successfully developed immunoaffinity magnetic bead (IMB) HPLC-MS/MS assay for sensitive determination of organophosphorus adducts to butyrylcholinesterase (BChE). A technique that simplifies sample preparation and reduces the amount of blood required.
- Applied IMB HPLC-MS/MS assay to samples collected from pesticide handlers in Washington State. Compared performance of IMB HPLC-MS/MS assay to procainamide-gel purification of OP-BChE adducts, and to measurements of (plasma) cholinesterase depression. This comparison demonstrated that the faster and simpler IMB methods could be used in the place of the original method without compromising sensitivity.
- Measured OP-BChE adducts and BChE activity in samples from cotton farmers and pesticide manufacturers in Pakistan. Analysis of this population of workers showed the adduct method to have good correlation with cholinesterase depression at high exposures as well as low. It also identified a group of workers who are at risk for pesticide poisoning.

Res 2: Using IPM to Reduce Pyrethroid Pesticide Exposures in Dairy Workers (NIOSH 2011-2016)

This project partners with Washington State University to reduce pesticide use in dairy operations by introducing IPM practices in these workplaces. We are working with a network of participants to develop a robust and practical IPM program that provides evidence for cost-effective interventions that can reduce pesticide usage in these farm operations. Pyrethroid pesticides are widely used in agriculture and are applied on livestock in the form of sprays, dips, and tags to control flies and other insects, particularly in dairy operations. Pyrethroids also represent a potential workplace health issue in this region. Since 2001, pyrethroid-related illnesses documented by WS-DOH have quadrupled, suggesting that exposures to pyrethroids have increased both at home and in the workplace.

In FY2013 we conducted a survey of dairy operators through a mail-in survey with the cooperation of the WA State Dairy Federation (WSDF); 414 surveys were mailed out to WSDF members in early November 2012, with a reminder sent in December 2012. To date, 78 surveys have been returned (19% response rate). The returned surveys came from dairy farms in 18 counties across the state, with most coming from Whatcom and Yakima Counties. These are counties with relatively high numbers of dairy farms, and the Yakima region is of primary interest to our ongoing study because of the intensive scale and number of large dairy operations. Our survey response indicates significant statewide interest among dairy managers in learning how to improve their on-farm integrated pest management practices. Using alternative reduced risk technologies should result in reduced pesticide usage. The survey results will be compiled into an outreach publication to dairy farmers.

In summer 2013 the IPM intervention of calf hutch bedding trials for the source reduction of fly larvae showed promise as an effective approach for fly control. Continued trials showed a positive correlation between calf-hutch bedding with lower pH and lower fly larvae counts. Lower larvae counts may allow operators to reduce their reliance on pesticides, especially the commonly used pyrethroids that in turn may reduce potential exposure for dairy workers.

In FY2013 we continued to reach out to the dairy farm community through site visits. We have also formed close collaboration with the PNASH Team members of the new "One-health" dairy pilot project to coordinate our work in this industry, share resources and support each other's project activities.

Prev 1: Reducing Agricultural Worker Risks through New and Emerging Technologies

(NIOSH 2011-2016, MAAF 2012-2013)



Pesticide related illness among agricultural workers remains a significant public health concern in the Pacific Northwest. Tree fruit production currently involves use of pesticides in high volumes, many highly toxic. From our previous studies of risk factors and best practices to reduce exposures, we have concluded that reliance on personal protective equipment is no longer a viable option. PPE is typically the last choice among industrial hygiene control strategies, yet it continues to be the primary option for agricultural workers. Product substitution and engineering controls are far more effective strategies for minimizing exposures. This project takes advantage of changes in pest control practices and pesticide application technologies in tree fruit that may lead to reductions in worker exposures. New chemicals are available to replace highly toxic OP and carbamate pesticides, and their adoption can be hastened by documentation of reduced risks for pesticide handlers. At the same time, new spray technologies are being examined by the tree fruit industry for pest control efficacy, allowing us the opportunity to evaluate how these might reduce worker exposures and pesticide drift.

In FY2013 we developed a suite of laboratory methods for analysis of personal exposure samples for acetamiprid, a relatively new pesticide used in many crops with few published human exposure studies. We completed dermal and exposure monitoring during field application for both azinphos methyl and acetamiprid. Currently, with an indication of a decline in acetamiprid use, we are expanding focus to include additional emerging alternative insecticides.

Prev 2: Ergonomic Evaluation of Emerging Technologies in the Tree Fruit Industry (NIOSH 2011-2016)

Technological advancement is important to American agriculture and will continue to transform work practices and equipment. The PNASH Center is working with the tree fruit industry to develop safety measures for mobile work platforms in order to design-out potential hazards. This project focuses on tree fruit agricultural activities that require high-intensity physical labor: pruning and structural cutting, green fruit thinning, and fruit harvesting. Traditionally, these activities are performed from ladders which are well established as the leading cause of injuries in Washington orchards. Now, new interventions are being introduced: innovations in hand-held tools (pruners), apple collection systems (vacuums and conveyors), and ladder replacements (mobile platforms).

We conducted a comparative evaluation for apple harvesting between the conventional ladders and semi-autonomous mobile harvest platform designs under development. We provided recommendations for safety improvements as well the comparison of whole body effort and back and shoulder inclination with both objective and subjective assessments. This collaboration led to the development of a new partnership with a local manufacturer who was designing and starting production of a different harvest platform. Again we conducted the ergonomic



assessments, and demonstrated that overall the workers harvesting apples from the platform had less impact on their bodies and lower exertion than those harvesting apples using ladders. This new semi-autonomous harvest platform, the Bandit Xpress by Automated Ag Systems, was named as one of the 2014 Top-10 New Product Winners. PNASH's hazard assessment will be presented along with the technology at the World Ag Expo 2014 in Tulare, CA and there is increasing interest within the tree fruit industry for further ergonomic assessments.

Edu 1: Pesticide Safety in Tree Fruit: Translating Research, Overcoming Barriers (NIOSH 2011-2016)

By providing access to information and solutions, orchard owners, managers, and handlers will be better equipped to protect workers from potential pesticide exposure and illness. This collaborative translation project capitalizes on the expertise of two institutions, the PNASH Center's health and safety research and the WSU Tree Fruit Research and Extension Center's research and outreach expertise within the agricultural community. The project uses new approaches to existing communication channels and evaluation methods.

In FY2013 we continued our educational dissemination and evaluation providing seven English and three Spanish trainings, and reached over 1800 participants. All but one English and one Spanish presentation incorporated the use of an audience response cards ("clickers") allowing us to gather substantial audience feedback on pesticide handler's interest, transfer and adoption of the interventions/solutions and messages. Our guide, Practical Solutions for Pesticide Safety (released 2012) is proving to be in-demand. This product's communication model could be effective in other industry sectors as well, as it speaks directly from "farmer to farmer."

In parallel, this project launched in FY2013 a process to engage the variety of stakeholders/leadership in pesticide education in Washington State. In the fall of 2013 we conducted interviews with 49 stakeholders using an advanced social science methodology called Q-sort. Many participants said they found the Q-sort activity interesting and appreciated seeing viewpoints (in the statement cards) that were both like and very unlike their own. We are now following up on this first phase of individual interview, with workshops to convene leadership for a joint discussion, and guided by the Q-sort results.

"The process does make you think about where you stand on pesticides and their use"
 "I had to check myself because I have a definite bias. I was trying to put the boot on the other foot"
 "Placing statements on the grid was harder and required me to re-think why I had placed some in certain categories"
 - Q-sort participants

Northwest Commercial Fishing Safety

In the past year, our major work on behalf of commercial fishing has taken place through our Washington State funded project, **Development of a Surveillance Strategy to Guide Injury Prevention Efforts in the Washington Commercial Fishing Industry**. PNASH investigators addressed a pressing information need – surveillance of non-fatal injuries. In collaboration with commercial fishing leaders and researchers at NIOSH, PNASH conducted an exploratory project to build new agreements with a variety of data sources (insurers, clinics, hospitals) and develop a system to characterize nonfatal injuries and intervention opportunities. Two data sources offered the UW researchers enough information to analyze: the US Coast Guard's (USCG) database (termed MISLE) and the database of a Seattle-based insurance claims adjuster. They were able to use these sources to describe non-fatal injury data for Washington-based commercial fishers.

Activity Classification	Percent
Handling gear on deck	13.3
Processing catch	12.4
Handling frozen fish (general)	41
Working in engine room	5.3
Unclassifiable	19.5
Other	8.8

In this exploratory review, analysts found:

- The most common injuries occur to workers **on deck**.
- **Wrists and hands** were the most common anatomical sites of injury in both data sources.
- Wrist and hand injuries frequently appear to be **due to crush injuries**, particularly during cargo handling operations, particularly when moving cases of frozen fish.

These findings suggest that hand-crush protection may prevent significant numbers of injuries, but specifics about the activities leading to injury were not available. **“We hope our results will motivate stakeholders in commercial fishing to organize a central database for non-fatal injury collection” – June Spector, PI.**

In FY2013 PNASH expanded our knowledge and connections with Northwest fishing industry partners through our project work and stakeholder meetings in Oregon. A University of Washington/PNASH graduate student has also pursued this field and during the summer of 2014 trained under the mentorship of Jennifer Lincoln, NIOSH AK. The combination of establishing connections, our previous work on personal floatation devices, and the opportunity for surveillance, now places PNASH in a new position as a scientific partner in commercial fishing safety.

Improving Safety in the Northwest Logging and Forestry Workforces



In FY2013, a unique issue emerged in Washington State. Land management companies have come forward with concerns regarding the high risk classification for manual (non-mechanized) loggers. The Pacific Northwest’s slopes are steep and often prohibitive to the safer mechanized logging seen used now throughout the US. The high risk classification stems from two issues – the high hazard work taking place, but also avoidance of joining the workers compensation insurance pool/workers designated as independent contractors. The **Washington State Logger Safety Initiative** was launched in FY2014. In FY2013 PNASH’s Dr. John Garland advised on the Initiative Taskforce on education strategies and we will continue to assist as needed

on education and evaluation efforts to understand our logging workforce, their risk factors, and what approaches make a meaningful impact in reducing injuries and fatalities within this workforce.

Dr. Garland has continued to work in close collaboration with Pacific Northwest contract loggers and state agencies responsible for logging and forestry sector safety. Dr. Garland serves on Oregon’s Forest Activities Board. In FY 2013 he consulted for the release of a **Hazard Alert: Chainshot in Logging Hazard**. He and Marcy Harrington also work on the NIOSH NORA Forest Sector Council, a group that has addressed national priorities and emerged hazards such as Chain Shot from mechanized equipment.

On a national level PNASH collaborated with Dr. Garland in the sponsorship of a two-day meeting, **Forestry Workforce Review and Assessment**, September 16-17. The meeting was held in Washington DC to bring together forestry sector leaders and assess recent and anticipated changes in the forestry workforce as well as current and projected workforce development needs, including improvements to workforce safety and health. Representatives came from a broad spectrum of the forestry industry leadership– from logging contractors, land managers, heavy equipment manufacturers, professional forestry and NIOSH AgFF Centers. The key issues identified were: estimating the forestry workforce with limited data sets and discrepancies in national level data; lack of health and non-fatal injury information; loss of expertise when the currently aging workforce retires; and training needs for young and inexperienced workers as they enter the post-recession workforce and replace retiring workers. Outcomes from the meeting include the identification of next step projects, the formation of an Action Planning Committee to address immediate needs and the need to create and sustain an ongoing forestry network.

PNASH is continuing to explore the complex issue of Hispanic contract reforestation workers. Planning is currently underway with Northwest partners for a project addressing the safety needs of this underserved workforce. Forest restoration or service work is the planting, managing (e.g. for fire hazard reduction) and thinning of commercial forestlands – remote and challenging work conducted on both public and private lands. Regionally this work is often done by immigrant Hispanic workers, frequently recruited directly from Mexico and working under a H2B visa for small contractors.

OTHER FY2013 PNASH RESEARCH PUBLICATIONS

Additional publications based on PNASH projects funded in previous cycles or other, non-NIOSH sponsorship.

Armstrong JL, Fitzpatrick CF, Loftus CT, Yost MG, Tchong-French M, Karr CJ. Development of a unique multi-contaminant air sampling device for a childhood asthma cohort in an agricultural environment. Armstrong JL, Fitzpatrick CF, Loftus CT, Yost MG, Tchong-French M, Karr CJ. Environ Sci Process Impacts 2013, 15(9):1760-7.

Armstrong JL, Fenske RA, Yost MG, Galvin K, Tchong-French M, Yu J. Presence of organophosphorous pesticide oxygen analogs in air samples. Atmospheric Environment 2013, 66:145-150.

Armstrong JL, Fenske RA, Yost MG, Tchong-French M, Yu J. Comparison of polyurethane foam and XAD-2 sampling matrices to measure airborne organophosphorus pesticides and their oxygen analogs in an agricultural community. Chemosphere 2013, 92(4):451-7.

Fenske RA, Lu C, Negrete M, Galvin K. Breaking the take-home pesticide exposure pathway for agricultural families: workplace predictors of residential contamination. Am J Ind Med 2013, 56(9):1063-71.