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# PACIFIC NORTHWEST AGRICULTURAL SAFETY & HEALTH (PNASH) CENTER

## ANNUAL REPORT October 2011 – September 2012

### Center Summary

The PNASH Center conducts research and promotes best health and safety practices for Northwest producers and workers in farming, fishing and forestry. Our goal is to prevent or reduce injury and illness for producers, workers, and their families. We support productivity, jobs and sustainable rural communities.

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 Health & Science 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 our newly awarded 5-year program cycle. PNASH is also regularly awarded project grants from other federal, state and non-profit organizations.



### Relevance

These three agricultural industries 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 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% of agriculture, forestry and fishing employers fall into this category, even though the AFF 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, skin diseases and certain cancers associated with chemical use and prolonged sun exposure.

### First Year Activities

This report's focus is on high impact activities and accomplishments for PNASH's new five-year program cycle. The bulk of activities in the first year of a research project are composed of completing human subjects review requirements, establishing working procedures and relationships with external partners, and initial sample and data collection and interpretation. All PNASH projects have completed these activities during year one.

### Key Personnel (Members of the PNASH Internal Advisory Committee)

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

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# PNASH FY11/12 ACTIVE NIOSH PROJECTS

## RESEARCH

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### **R1: Measurement of Farmworker Exposure to OP Pesticides through Protein Adducts** (NIOSH 2011-2016)

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.

### **R2: 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.

### **R4: Pilot Studies of Risk Factors for Heat-Related Illness in Agricultural Workers in WA** (NIOSH 2011-2013)

This two-year pilot project aims to identify potential risk factors for heat-related illness (HRI) in farmworkers. The assessment includes a computer-based survey measuring the physiological effects of heat exposure (heat strain). Our results will generate baseline data, setting the stage for future larger studies of the association between potential HRI risk factors and heat effects as well as studies of interventions to reduce HRI.

**Pilot: Development of a Work Stress Survey for Farmworkers** (PNASH Small Grant 2011-2013) Agricultural work in particular is known for its heavy burden of stress. This project aims to develop a culturally appropriate stress survey for agricultural workers to compare stress levels during high and low work demand periods.

## PREVENTION AND INTERVENTION

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**P1: Reducing Agricultural Worker Risks through New and Emerging Technologies** (NIOSH 2011-2016, MAAF 2012-2013) We are evaluating interventions designed to reduce worker exposure and risk during pesticide applications in tree fruit. We are working with land grant universities, industry, producers, and workers to ensure that the decision process used for adopting new pesticide products and new spray technology development includes worker health and safety.

**P2: Ergonomic Evaluation and Development of Best Practices for the Use of Mobile Work Platform Technology in Orchards** (WA State MAAF 2009-2011, 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.

**P3 (Pilot): Assessing Agricultural Safety and Health among Hmong Farmers** (NIOSH 2011-2016) We are working to identify agricultural safety and health issues among Hmong refugee farmers in Washington State. Using novel community-based participatory approaches along with conventional industrial hygiene methods, a systematic assessment of the working conditions and practices of Hmong refugee farmers is being conducted.

## EDUCATION

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**Edu 2: Pesticide Safety in Tree Fruit: Translating Research, Overcoming Barriers** (NIOSH 2011-2016) Our goal is to minimize worker and family pesticide exposure in the tree fruit industry by translating and disseminating research results and overcoming barriers to pesticide safety practices. By providing access to information and solutions, orchard owners, managers, and handlers will be better equipped to protect workers from pesticide exposure and illness.

**Pilot: Reducing Occupational Health and Safety Risks among Young Workers in Agriculture through Clinician Engagement** (PNASH Small Grant 2011-2013) We are using a local clinician champion model to provide evidence-based accredited training and introduce a rapid clinical assessment tool developed by the Migrant Clinicians Network.

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# PNASH FY11/12 ACCOMPLISHMENTS

## Core Programs Organizing, Translating and Leveraging Research

### ADMINISTRATIVE AND PLANNING CORE

#### Changes in Personnel

In 2012 PNASH's Director of Outreach, Helen Murphy-Robinson, retired after eight years of exceptional service to the Center and our mission. She continues to serve as a project advisor on an ad hoc basis. After a review of Center needs and a national search, Dr. Victoria Breckwich Vásquez was hired to serve as PNASH's new Director of Community Engagement & Education. Dr. Breckwich Vásquez has worked extensively in public and community health both in the US and Latin America. She has an exceptional background in community-based research, evaluation, and strategic planning.

PNASH Internal Advisory Committee (IAC) member and past project Principal Investigator, Dr. Diane Rohlman, accepted a position at the University of Iowa. Her continued ties to the Northwest allow for continued collaboration with PNASH in the future. Dr. Christopher Simpson, a PNASH Principal Investigator for six years, has accepted the vacant IAC seat.

#### National Review of the NIOSH Agriculture, Forestry and Fishing Program

PNASH participated with the other programs under NIOSH AgFF to prepare and present statements of impact and accomplishments of PNASH's work from 2007-2011. An independent review 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." They also noted that NIOSH has engaged in activities to move its research into actual safety and health practice "on a very significant level."

#### Student Participation

The PNASH Center increased its student mentorship role in 2011, enlisting eight new University of Washington students (two graduates and six undergraduates) as research and teaching assistants and interns during the summer. The majority of the students have continued to have roles in ongoing PNASH research projects throughout the 2011-2012 academic year.

#### PNASH Center Research Review

Held on Sept 17, 2012 in Seattle, this two-day event engaged key partners in a discussion of our past accomplishments and the directions for our new work. Both in-person and remote participation were available and forty-seven people from a variety of industry and professional organizations participated. The goals of this event were to convene current project partners and investigators; present project progress, preliminary results and new directions, and; advise project leadership investigators in coming work.



Program presentations are available online at: [http://depts.washington.edu/pnash/2012\\_research\\_review](http://depts.washington.edu/pnash/2012_research_review)

#### Leveraged Projects and Activities

Each year, thanks to the nucleus of research expertise and support formed by the Center, our associated faculty and staff researchers are able to successfully procure additional funds to help advance the goals and priorities of the PNASH Center and pursue our mission beyond the limits of the funds available through NIOSH.

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In 2012 the following ongoing projects addressing PNASH's mission were granted to PNASH investigators:

- **Development of Quantitative Microbial Risk Assessment (QNIRA) Models for Food Safety in the Production of Pears, Cherries, Raspberries, and Blueberries.** PI: J.S. Meschke. Funder: Washington Medical Aid and Accident Fund.
- **Development of an Educational Video for Farmworker Ladder Safety and Heat Illness Prevention.** PI: R.A. Fenske. Funder: Washington Medical Aid and Accident Fund.
- **Improving PPE Effectiveness in Agricultural Applications.** PI: M. Yost. Funder: Washington Medical Aid and Accident Fund.
- **Development of a Surveillance Strategy to Guide Injury Prevention Efforts in the Washington Commercial Fishing Industry.** PI: J. Spector. Funder: WA Medical Aid and Accident Fund.
- **PNASH Center Administrative Supplement for Community Education and Sample Analysis.** PI: R.A. Fenske. Funder: NIOSH/CDC.
- **Development and Validation of Laboratory and Field Methods for Occupational Exposure to the Insecticide Acetamiprid in Washington State Orchards.** PIs: G. Onstad, R.A. Fenske. Funder: Washington Medical Aid and Accident Fund.
- **Changing the Climate Conversation.** PI: R.A. Fenske. Funder: UW School of Public Health.
- **Preclinical Assessment for Parkinson's.** PIs: C. Simpson, H. Checkoway. Funder: UW Royalty Fund.
- **ConneX UW Extension Course: ENVH490 Introduction to Children's Environmental Health & Disparities Research.** PI: C. Karr. Funder: HRSA through the Yakima Valley Farm Workers Clinic.



## OUTREACH AND EDUCATION PROGRAM

### Regional PNASH-Sponsored Educational and Outreach Events

- Washington Governor's Ag Safety Day. Wenatchee, WA: February 22, 2012.
- Research Poster Session. 21<sup>st</sup> Annual Western Migrant Stream Forum. Portland, OR: February 2012.
- Farmworker Health Fairs. Monitor, WA and Wenatchee, WA: July 12-13, 2012.
- Environmental and Pediatric Health Seminar Series. Toppenish, WA: Summer 2012.



### Educational Video for Farmworker Ladder Safety and Heat Illness Prevention

This small project expands on two successful products developed in the last program cycle – reproducing two Spanish radio programs into educational videos for farmworker training:

- “Workers’ Ladder Injury Stories.” Radio Talk Show on Ladder Injuries.
- “Heat Illness.” Four Radio Novellas on Heat-Related Illness.

The audio programs were aired widely in 2011 through Hispanic radio and are available at:

[http://depts.washington.edu/pnash/audio\\_library](http://depts.washington.edu/pnash/audio_library). The expansion of these products from audio media to video responds to repeated requests received by PNASH from regional growers and farmworkers at training events over the Winter of 2011/2012. In FY2011 we worked in close collaboration with KDNA Radio in the pre-production activities of re-scripting, story boarding and the recruitment and rehearsal of community actors. PNASH coordinated the videography and the external review and development of the script. The primary shoot took place over August – September 2011 and the product review and development will continue into FY2012. This project was funded in part through an external award by the Washington Medical Aid and Accident Fund.

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### **ConneX UW Extension Course: ENVH490 Introduction to Children's Environmental Health & Disparities**

**Research.** This course and field experience was supported through HRSA through the Yakima Valley Farm Workers Clinic (YVFWC). Since 2003, PNASH has led a summer environmental education course in Yakima, WA with university credit for ConneX program students. ConneX is an education outreach program at the YVFWC with the aim to create a competitive pool of young people from disadvantaged backgrounds in the Yakima Valley to enter health professions. In 2012 thirteen ConneX students completed the Summer 2012 ENVH490 course and a public seminar was offered with guest speakers on 9 topics. The field research component of the course included the student administration and analysis of 540 community surveys assessing the Yakima community's health and safety knowledge and concerns regarding homes & neighborhoods, accessing information, meals & playtime, and environmental health.



**El Proyecto Bienestar** (or, Well Being Project) is a long-standing community health intervention effort guided by a Yakima Valley community advisory board and a partnership between the University of Washington, Northwest Communities Education Center/Radio KDNA, Heritage University, and the Yakima Valley Farm Workers Clinic. Our current Proyecto Bienestar projects include Aggravating Factors of Asthma in a Rural Environment (NIH&CDC 2009-2013) and ConneX Program and UW Summer Extension Course (HRSA/Yakima Valley Farm Workers Clinic 2011-2012).

Dr. Victoria Breckwich Vásquez began her position as Director of Community Engagement & Education in September 2012. To launch her work, she has collaborated with Center leadership to conduct a needs assessment. Through personal semi-structured interviews with key partners and stakeholders we are learning about our external engagement, impacts and needs. This process and a following action plan will continue into the next FY.

### **PILOT/FEASIBILITY AND EMERGING ISSUES PROGRAM**

#### **Small Grant Awards**

The PNASH Center selected its Small Grant Award recipients for 2012-2013:

- **Parkinsonism among Washington State Agricultural Pesticide Handlers.** PI: Dr. Harvey Checkoway, University of Washington. This 1-year project will characterize potentially etiologic relations between cumulative occupational exposure to organophosphorus insecticides and the prevalence and severity of Parkinsonism signs and symptoms among 100 agricultural pesticide handlers in the Yakima Valley prior to the spray season.
- **Pilot Study to Assess Risk Factors for Heat-Related Illness among Oregon Farmworkers.** PI: Dr. Jeffery Bethel, Oregon State University. This 1-year pilot will identify personal, medical, cultural, environmental, and work-related risk factors for HRI among Latino farmworkers in Oregon.

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# PNASH FY2011 ACCOMPLISHMENTS

## Research Project Activities

Research for Understanding, Intervention, and Prevention

### Northwest Worker Pesticide Protection Initiative

#### **Edu 2: Pesticide Safety in Tree Fruit: Translating Research, Overcoming Barriers**

The major impact this year was the promotion and dissemination of the *Practical Solutions for Pesticide Safety* (PSPS) guide developed by PNASH during our previous NIOSH funding cycle. Dissemination was based on an individual's active interest in using the guide. In this year a total of 483 English and 355 Spanish guides were disseminated based on a demonstrated interest in using the guide through interaction with staff at conference exhibits, sign-ups during presentations about the guide, direct requests, and online downloads:

[http://depts.washington.edu/pnash/practical\\_solutions](http://depts.washington.edu/pnash/practical_solutions). The guide was highlighted by exhibits at five industry trade conferences, where we provided educational sessions. We also presented one platform talk and one poster at academic meetings. In addition, 72 copies of the Spanish, English, and CD versions were provided to the stakeholders that participated in the selection and evaluation of the solutions and the production of the guide.

An important outcome of the dissemination of the PSPS guide is that other organizations have initiated their own use and dissemination. "It's pure gold!" declared a loss control manager at a major Northwest workers' compensation company for the agriculture industry. In 2012-13 this company is using the PSPS guide for the annual training they provide for clients, in which approximately 1000 growers, managers, and pesticide handlers attend either an English or Spanish session. The company is reproducing the guide at their own cost and providing each participant a copy.

In 2012 the Good Fruit Grower published the article, "New pesticide safety guide released: Guide includes practical solutions to aid in pesticide handling safety" after the journalist, Melissa Hansen, attended one of our presentations. This widely-read trade journal for orchardists and vintners is published by a grower-owned nonprofit company, the Washington State Fruit Commission, and its readership is both national and international. <http://www.goodfruit.com/Good-Fruit-Grower/Web-2012/New-pesticide-safety-guide-released/>

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



We developed a sensitive mass spectrometric (MS)-based assay that can provide an accurate determination of the percentage modification of the active site serine residues of plasma butyrylcholinesterase (BChE), and applied this assay to archived plasma samples obtained from pesticide-exposed farmworkers in Washington State.

Three organophosphorylated peptide analogs representing the diethoxyphosphorylated-, monoethoxyphosphorylated- and dihydroxyphosphorylated(phospho)-O-serine peptides were synthesized, and subsequently conjugated to immunogenic proteins. These haptens were then used to generate monoclonal antibodies. Large scale ( $\mu\text{g}$ ) preparation of antibody is currently underway. To this date, however, antibodies to the native peptide structures have not been procured although polyclonal antibodies to this native peptide had been previously prepared.



"It's pure gold!"

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## **Res 2: Using IPM to Reduce Pyrethroid Pesticide Exposures in Dairy Workers**

We developed the Dairy Pesticide Practices Survey along with our collaborators. The Survey is five pages in length and contains questions regarding pest prevalence and pest management practices. The survey, along with a cover page explaining the purpose of the survey and overall project, was mailed to members of the WA State Dairy Federation (WSDF) in October 2012.

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

We cultivated a productive working relationship with two regional stakeholder organizations that had not previously participated in PNASH research activities. These new relationships allowed us to complete detailed dermal and inhalation exposure monitoring for twelve pesticide handlers applying azinphosmethyl (AZM) in Eastern Washington. Samples were analyzed in the laboratory for AZM and AZM-oxon, the latter which has been identified as being present in the environment along with AZM. If present, AZM-oxon is important to include in the risk-risk analysis compared with acetamiprid, because it is considered to be more toxic than AZM. We obtained additional funding to support a PhD student to conduct the development and validation of inhalation and dermal sampling and laboratory analysis methods for acetamiprid, the alternative pest control product to AZM that will be used in the risk-risk analysis.

## **Agricultural Health Communication and Literacy**

### **Res 4: (Pilot) Study of Risk Factors for Heat-Related Illness in Agricultural Workers**

We conducted Participatory Rural Appraisal (PRA) workshops with crop workers at three different worksites to identify potential barriers to and facilitators of Heat Related Illness (HRI) prevention and treatment. We developed and provided HRI education at each worksite in conjunction with the PRA workshops. Workers provided positive feedback on HRI education, as demonstrated by the following quotes from workshop participants:

- “My husband works applying pesticides at the orchards and he uses a PPE. He is always sweaty when comes home. Now that I learned that the PPE is not breathable I will talk to him about the importance of cooling down during breaks and also drinking enough water.”
- “I didn’t know one can have cramps due to dehydration. It’s good to know that.”
- “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.”



### **Prev 3 (Pilot): Study Assessing Agricultural Safety and Health among Hmong Farmers**

We were able to successfully establish contact and a working relationship with the Hmong community in the Skagit Valley. This is a regional stakeholder group that PNASH had not successfully reached in past years. We have visited farms of 9 of the 11 participants up to five times over the growing season. The farmers are very welcoming and have allowed photographs to be taken of their work activities.

## **Northwest Fishing and Forestry Safety**



### **Commercial Fishing Interagency Collaboration**

Our first year of the new program cycle saw renewed collaboration with commercial fishing stakeholders and investigators. PNASH launched a small project on Personal Floatation Device (PFD) use among Dungeness crab fishermen in response to Coast Guard concerns, working in collaboration with NIOSH. NIOSH investigator Dr. Jennifer Lincoln’s previous research showed that many of the fishing fatalities in Oregon were due to fishermen falling overboard, and that none of the fishermen who died this way were wearing a PFD. The PNASH research team identified PFD use, safety training and on-board safety drills, and a better understanding of vessel stability as the keys to

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reducing fatality and injury rates. PNASH-conducted surveys showed personal preference and comfort played a huge role in determining whether PFDs were worn, that the USCG/NIOSH-identified PFDs largely received favorable reviews from those who tested them, that most respondents did not regularly practice on-board safety drills, and that nearly half of crew members had not received safety training. See the project report at:

[http://depts.washington.edu/pnash/files/03\\_research\\_pub/03\\_ORCrab\\_Fishing\\_SafetyAsses.pdf](http://depts.washington.edu/pnash/files/03_research_pub/03_ORCrab_Fishing_SafetyAsses.pdf)

In the past year, our collaboration with commercial fishing leaders, researchers and trainers has led PNASH investigators to address a pressing information need – surveillance of non-fatal injuries. With funds obtained from the Washington State Medical Aid and Accident fund, PNASH has begun an exploratory project to build new agreements with a variety of data sources (insurers, clinics, hospitals) to characterize nonfatal injuries and intervention opportunities.

### **Improving Safety in the Northwest Logging and Forestry Workforces**

PNASH Investigator Dr. John Garland has continued to work in close collaboration with the northwest state agencies responsible for updating and enforcing the safety and health codes for the logging and forestry sectors. In our FY11/12. Dr. Garland served on Oregon’s Forest Activities Board and has been called on to provide guidance and comments to Washington State Labor and Industries efforts to update its logging safety code.

PNASH produced our 10<sup>th</sup> edition of the Northwest Forest Worker Safety Review (NWFWSR). This edition was headlined by the article “The Changed Workforce: Issues, Opportunities, and the Future.” All issues of the NWFWSR are available online at: [http://depts.washington.edu/pnash/forestsafety\\_news](http://depts.washington.edu/pnash/forestsafety_news)

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