# Southwest Center for Agricultural Health, Injury Prevention and Education

**Summary Annual Report**

**September 30, 2016-September 29, 2017**

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# SECTION I

## Center Summary

The Southwest Center for Agricultural Health, Injury Prevention and Education (SW Ag Center) is a well-established center based at The University of Texas Health Northeast in Tyler, Texas. The SW Ag Center serves Public Health Region 6 which includes Arkansas, Louisiana, New Mexico, Oklahoma and Texas. The mission of the SW Ag Center is to *improve the safety and health of agricultural, forestry and fishing (AFF) workers*. This is accomplished through an integrated program of research, intervention, education and outreach activities that engage and leverage a network of strategic partners who represent the interests of a diverse worker population and a wide range of agricultural production in the region. Similarly, the Center's scope of work is organized around the theme "Building Strategic Partnerships to Improve the Health and Safety of Diverse Agricultural, Forestry and Fishing Populations". The Center brings together an experienced leadership team of staff, internal advisors and external advisors in an organizational structure that facilitates a cohesive, coordinated and synergistic operation. The Center's research portfolio includes three basic science projects: physical exposures of musculoskeletal symptoms among logging machine operators; poultry dust and lung inflammation; and occupational exposures of tree planters in TX, LA and AR. Intervention projects are aimed at reducing pesticide exposure among Latino youth in OK and influencing injury risk factors with TX shrimp fishermen. Commercial fishing will also be addressed by a translational project studying heat stress, fatigue, recovery and the role of cooling materials on personal flotation device (PFD) use among LA fishermen. AFF surveillance research will be expanded by a project that explores transportation related AFF mortality and morbidity. The Center's impact will be expanded by a feasibility program and outreach core that augment the proposed scope of work and are responsive to emerging issues. The Center's feasibility program enhances research projects, supports mentorship relationships between senior and junior researchers and is responsive to emerging issues within AFF in the region. Two feasibility studies were active in year one of this funding cycle. Outreach activities for year one include support for an agricultural safety and health intern, an agricultural medicine workshop, professional presentations and exhibits at regional and national conferences. Research and outreach are guided and improved by an integrated evaluation program. The Center evaluation program uses interconnected logic models to assess goal attainment. Within the last twelve months, a needs assessment was designed to better understand the agricultural occupational health and safety concerns in the region.

## Relevance

The SW Ag Center is uniquely positioned to address farming, ranching, commercial fishing, forestry and logging occupational safety and health within its service region through research projects, feasibility studies and outreach activities. Research projects specifically address diverse regional worker groups, including Vietnamese fishermen and adolescent Hispanic farmworkers. The Center has a record of success working

with special populations and producing culturally appropriate interventions in the language preferred by the audience. The SW Ag Center has two funded projects related to commercial fishing, a substantial operation along the Gulf of Mexico. The Center also has two projects dedicated to the forestry and logging industry which is a major employer in northeast Texas, Arkansas and northern Louisiana. One of the current projects builds on important work conducted in the previous cycle related to poultry dust and inflammation and the final project is leveraging motor vehicle crash data for injury surveillance. Current surveillance systems do not meet the unique needs of AFF workers and contribute to the gap in knowledge regarding the prevention of transportation-related injuries. Learn more about the currently funded projects at https://www.uthealth.org/southwest-center-agricultural-health-injury-prevention-education/current-projects.

Feasibility studies allow the Center to investigate emerging issues or gaps in research/data while fostering mentoring relationships with scientists new to the field. Studies active in year one include a comparison of physical risk factors among tree planters using mechanized and hand planting methods and an investigation of the relationship between work hours and chronic disease among farm workers. Principal investigators (PIs) from these studies are located in Texas and Alabama. Results from the tree planters study in Alabama will be applicable to the forestry industry in the Center's service region. Information about past and current feasibility studies is available at https://www.uthealth.org/southwest-center-agricultural-health-injury-prevention-education/feasibility-studies.

Outreach activities address occupational safety and health across AFF industries through frequent online communication, internships, trainings, presentations and the development and dissemination of educational materials. Monthly safety messages are delivered to approximately 1200 producers, educators and scientists (https://www.uthealth.org/southwest-center-agricultural-health-injury-prevention-education/monthly-safety-blasts) and are regularly reprinted in trade publications like the Texas Logger, sent to industry list servs (Arkansas Ag Science Teachers, Louisiana Extension) and shared on Facebook. The SW Ag Center builds the capacity for future professionals in agricultural safety and health through a collaborative internship with the Noble Foundation (Oklahoma). Agromedicine, logging/forestry, migrant health, tractor safety, stress management and bites and stings were specifically addressed in year one. Additionally, the SW Ag Center collaborated with the other ten Ag Centers to maintain a joint YouTube channel in order to respond to the growing popularity of social media among AFF producers and educators; http://www.youtube.com/user/USagCenters. The Program Director and Outreach Education Coordinator also lead national promotional campaigns for National Farm Safety and Health Week and Agricultural Safety Awareness Program Week through the development of social media kits, presentations, press releases, flyers and email blasts. The most notable outreach achievement for year one is the establishment of Texas Ag Memorial Day, a collaborative effort between the Dineen family, Farm Bureau, the governor's office and the SW Ag Center.

Evaluation data for research projects, feasibility studies and outreach initiatives are collected to record current work and lead future action. Mid-year interviews were conducted with PIs to assess progress and identify barriers to research. A needs assessment was created to gather information on persistent and emerging needs that are regionally relevant.

## Key Personnel

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|---|---|---|---|
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Learn more about the SW Ag Center faculty, staff, principal investigators and advisors at https://www.uthealth.org/southwest-center-agricultural-health-injury-prevention-education/meet-administrative-staff.

## Ag Center web link: https://www.uthealth.org/swagcenter

- Facebook: www.facebook.com/swagcenter
- Twitter: https://twitter.com/SouthwestAg95
- SW Ag Center YouTube Channel: https://www.youtube.com/user/swagcenter1
- Ag Centers' Joint YouTube Channel: http://www.youtube.com/user/USagCenters

# SECTION II

## Center Cores

## Planning and Evaluation Core

The SW Ag Center is in its twenty-second year of operation. The contact database maintained by the Center has grown and evolved over the last two decades and was in need of attention. It is vital that the contact database stay current because it is used to reach partners with safety messages, Center updates and opportunities. The SW Ag Center undertook a considerable effort to update the email addresses for all extension agents in the five state region, trade association staff, project partners and long-term supporters. As the contact database was refreshed, so was the complete look of the Center. A new logo and color scheme were adopted to bring a fresh, sharp image to the new funding cycle. Check out our new look on Facebook at www.facebook.com/swagcenter.

The Center evaluator, Sharon Newbill, worked with Center staff to design a brief needs assessment survey. The survey was scheduled for dissemination on September 1st; however, the email delivery was postponed due to Hurricane Harvey. Many of the Center's partners were impacted by the hurricane or involved in relief efforts. The survey will be distributed in October 2017 to the contacts included in the updated database to better understand what they need related to agricultural occupational health and safety, who they rely on to provide this information and how they would like to receive it. The results from the needs assessment will be used to drive feasibility study priorities and outreach programs.

## Outreach Core

Texas Agriculture Memorial Day is a day to remember and honor the lives and sacrifices of farmers and ranchers who put forth great effort to raise food and fiber for this nation. This event was first envisioned by a farm family that experienced a tragedy while working in an agricultural environment. The Dineen family lost their five year old son when he was run over by a truck on the farm where they were baling hay. They seek to educate other families in order to avoid another unfortunate incident. The strategic partners for this undertaking included the governor's office, Farm Bureau and the SW Ag Center. The inaugural Texas Ag Memorial Day was proclaimed by Governor Gregg Abbott and recognized on November 21, 2016 in Austin, Texas. State Representative, John Wray, read the Governor's proclamation and recognized 21 individuals who were nominated for recognition in 2016. Texas Ag Commissioner, Sid Miller, welcomed and visited with the numerous honored families and friends during the

ceremony. Future plans for the Texas Agriculture Memorial Day include a website and an interactive kiosk located in the Agricultural Museum in the state capitol. From the kiosk visitors will be able to search for honorees and read about their contributions to Texas Agriculture as well as nominate someone they feel should be included in the memorial. The kiosk will also have links to safety education information and incident prevention provided by the SW Ag Center. The Center presented on Texas Ag Memorial Day at the International Society for Agricultural Safety and Health in June 2017. Center leadership and staff will continue to promote Texas Ag Memorial Day and direct applicable families and individuals to the registry.

The SW Ag Center also participated with the other AFF Centers in three national ag safety awareness campaigns, including: American Farm Bureau's Ag Safety Awareness Week (March 2017), the NIOSH/CDC Beat the Heat Summer Campaign (June-August 2017) and the National Farm Safety and Health Week (September 2017). The SW Ag Center coordinated the efforts to promote the Ag Safety Awareness Week campaign. The Program Director and Outreach Coordinator created the social media kit, participated in television and radio interviews and created videos for social media. During this week, the AFF Centers' YouTube page experienced a 113% increase in minutes watched and an 84% increase in views. Throughout this effort, the Agricultural Safety and Health Centers built a strong working relationship with the American Farm Bureau Federation. The Center also took part in the NIOSH/CDC Beat the Heat Summer Campaign specifically by contributing to the social media kit and posting safety messages on social media throughout the summer. Evaluation is currently underway to measure the national impact of the Beat the Heat Campaign. National Farm Safety and Health Week took place during September 17-23, 2017. Our Center again led the promotional effort by delegating responsibilities and ensuring that high quality materials were developed. Center staff created the social media kit, collected images for posts, reviewed all materials and collected evaluation metrics. The SW Ag Center also met with the other NIOSH Centers at the State of the Science meeting in Denver where Dr. Levin presented a poster on Commercial Fishing Safety in the Gulf of Mexico: The Decade in Review.

Outreach resources available through the Center include:

- Educational Materials, https://www.uthealth.org/southwest-center-agricultural-health-injury-prevention-education/agricultural-safety-resources
- Monthly Safety Blasts, https://www.uthealth.org/southwest-center-agricultural-health-injury-prevention-education/monthly-safety-blasts
- SWAGbites Bulletin, https://www.uthealth.org/southwest-center-agricultural-health-injury-prevention-education/swagbites

Contact Nykole Vance at 903-877-7935 or by email to Nykole.Vance@uthct.edu for more information on outreach activities and resources.

## Pilot/Feasibility Program

Two projects were described in the competitive application and reviewed before the beginning of the cycle in order to award the projects in year one. The projects are described below.

1. Comparison of Physical Risk Factors Among Tree Planters Using Mechanized and Hand Planting Methods

   PI: Mark Schall, PhD, AEP, Auburn University

   This project compares the trunk and upper arm postures, movement velocities, forceful muscular exertions, and intensity of occupational physical activity among reforestation planters using mechanized and hand planting methods. Data were obtained from four (4) hand planters during the planting season. These data were able to be combined with data collected from an additional ten (10) reforestation planters collected during the previous planting season. This data set of 14 planters has been used to develop several publication materials. Funding provided through the SW Ag Center was leveraged to complete a small simulation study to assess whether the tool selected during hand planting has a meaningful effect on a planter's exposure to physical risk factors associated with the development of musculoskeletal disorders (MSDs). Data collection methods for this simulation were consistent with those proposed in the pilot study including measuring muscle activity with surface electromyography (EMG) and exposure to extreme postures and joint velocities with inertial measurement units (IMUs). Analysis of that data is ongoing.

   Granzow RF, Schall MC, Smidt MF, Chen H, Fethke NB, Huangfu R: [2018] Characterizing Exposures to Physical Risk Factors among Reforestation Hand Planters in the Southeastern United States. Applied Ergonomics, 66, 1-8.

2. The Relationship Between Work Hours and Chronic Disease Among Farm Workers

   PI: Sadie Conway, PhD, MA, The University of Texas School of Public Health

   This project employs innovative analytical methods to systematically describe the work hour patterns of hired farm workers as well as to assess the relationship between work hours and three cardio-metabolic conditions. Currently, two manuscripts are being drafted based on the project's findings. One manuscript describes work hour patterns among hired farm workers, which has not previously been published on a representative sample of farm workers. The second manuscript provides evidence on the relationship between work hours and cardio-metabolic conditions in hired farm workers, with a particular focus on the influence of season, task, and sex.

Four applications were submitted for feasibility studies in year two. They have been reviewed and scored. Two of the projects will be funded at the beginning of year two. The other two projects will be supported through carryover funds, if approved.

For more information, visit https://www.uthealth.org/southwest-center-agricultural-health-injury-prevention-education/feasibility-study-opportunity or contact Vanessa Casanova, PhD at 903-877-5896 or by email to Vanessa.Casanova@uthct.edu .

Read more about past and current feasibility studies at https://www.uthealth.org/southwest-center-agricultural-health-injury-prevention-education/feasibility-studies.

## Research Projects

### Physical Exposure and Musculoskeletal Symptoms among Logging Machine Operators

PI: Dave Douphrate, PhD

Host Institution: University of Texas Houston School of Public Health San Antonio Campus

Logging machines may expose workers to risk factors for the development of adverse musculoskeletal outcomes, which include whole-body vibration (WBV), static and awkward postures, and repetitive hand and feet movements while working. The objective of this study is to provide new information about associations between exposure to physical risk factors and musculoskeletal symptoms among logging machine operators (LMOs). In the first year of the study, IRB approval was received and a research assistant was hired. Data collection equipment was purchased to enable field-based exposure assessment of WBV and limb/trunk posture and motion. Field-based exposure data collection protocols have been developed. Custom software to enable the efficient processing of collected vibratory, muscle activity, and posture data was also developed. A novel mobile application to be used by LMOs to report their daily logging machine operation activity and symptomology was designed and launched. Subject recruitment and data collection of daily LMO machine operation activity began in year one. Study participant recruitment was to be conducted at a logging conference in Arkansas. Due to Hurricane Harvey, this data collection activity was cancelled out of concern for study personnel travel safety and security. Future project activities will include continued participant recruitment and data collection.

## Poultry Dust Exposure and Lung Inflammation

PI: Vijay Boggaram, PhD Host Institution: University of Texas Health Northeast

Persistent inflammation due to organic dust exposure underlies lung injury and development of respiratory diseases. Molecular mechanisms mediating lung inflammatory responses to organic dust are not fully understood. Using poultry dust as a model organic dust, our research is aimed at understanding mechanisms of lung inflammatory responses. Signal transducer and activator of transcription-3 (Stat3) is a transcription factor that controls inflammatory and immune responses and mediates interleukin-6 (IL-6) signaling. We found that treatment of Beas2B bronchial epithelial cells or primary normal human bronchial epithelial cells (NHBE) with poultry dust extract (dust extract) activated Stat3 phosphorylation in a time dependent manner with maximal phosphorylation at 60 min after treatment. Similarly, exposure of mice to dust extract via intranasal inhalation increased Stat3 phosphorylation in lungs at 60 min after exposure. Pharmacological inhibition of Stat3 with stattic attenuated IL-8, IL-6, ICAM-1, IL-1β, CCL2, PTGS2 mRNA levels in dust extract treated Beas2B cells. siRNA knock-down of Stat3 in Beas2B and NHBE cells attenuated dust extract induction of ICAM-1 and proIL-1β, and to a lesser degree IL-6 and IL-8, but had no effect on PTGS2 protein levels. In Beas2B cells, antioxidants such as 1-(2-Cyano-3,12,28-trioxooleana-1,9(11)-dien-28-yl)-1*H*-imidazole (CDDOIm), n-acetylcysteine (NAC), or dimethylthiourea (DMTU) reduced Stat3 phosphorylation induced by dust extract. Treatment of mice with CDDOIm reduced Stat3 phosphorylation in lungs induced by dust extract. In summary, these data indicate that oxidant stress mediated Stat3 activation is an important regulator of induction of lung inflammatory gene expression by poultry dust.

## Occupational Exposures of Tree Planters in the Forestry Services Sector

PI: Vanessa Casanova, PhD Host Institution: University of Texas Health Northeast

In year one of study, IRB approval was received and a research assistant was hired. These two critical accomplishments have allowed us to make contact with tree planters and contractors for recruitment in the upcoming planting season. Over the past year we have presented at one national conference (International Society for Agricultural Safety and Health) as well as a webinar for the AgriSafe Network. Outreach and education were conducted with regional pine seedling nurseries. In addition, two simulated studies related to noise and exhaust exposure have been designed and will be implemented prior to planting season early this fall.

## Intervention Project

### Reducing Pesticide Exposure among Latino Adolescents Through Promotora-Based Interventions

PI: Michael Merten, PhD Host Institution: Oklahoma State University

During year one of this project, IRB approval was received from the host institution and some key personnel were hired including a part-time project coordinator and a research assistant. Key personnel took existing La Familia Sana program curriculum and created an adapted version for adolescents. Pre-test and post-test assessment measures have been identified and adapted. Our team has identified potential promotoras in the rural context to deliver pesticide safety trainings that will begin in spring 2018. Contact was made with a nursery in the area to widen our potential reach for participant recruitment.

## Translation Project

### The Impact of Thermal Load on PFD Use among Shrimp Fishermen

PI: Ann Carruth, DNS, RN Host Institution: Southeastern Louisiana University

Shrimp fishing in the Gulf of Mexico is performed during the hottest months of the year. Gulf shrimp fishermen are frequently exposed to high heat while performing physically demanding tasks and as a result, have a disproportionate risk of heat stress. This translation project applies validated technology for heat stress assessment as well as testing heat mitigating PFDs and cooling devices; the findings will be integrated into a social marketing approach that has demonstrated evidence for behavior change with this population. In the first year of the study, our team received IRB approval at 3 out of 4 universities. Two consent forms will be used for the heat stress evaluation and another for follow-up qualitative data collection. Research protocols with specific instructions on the use of Zephr bioharness were developed. Equipment has been ordered with plans to pilot test methods of data collection in a simulated work environment.

## Surveillance Project

### Leveraging Motor Vehicle Crash Data for Injury Surveillance and Research in AFF

PI: Eva Shipp, PhD Host Institution: Texas Transportation Institute

Workers in the Agriculture, Forestry and Fishing sector (AFF) experience substantially higher crash-related fatal injury rates compared to other workers. The objective of the

Southwest Agricultural Crash Surveillance System (SW AgCRASH) project is to inform the development of AFF crash surveillance systems while also filling gaps in our understanding of transportation-related injuries in AFF populations. This is being accomplished by constructing a regional crash database covering five states (AR, LA, NM, OK, TX) and analyzing structured (e.g., coded) crash data as well as text narratives. During the first year, the project team successfully procured data from all states in the SW Ag Center region. These data represent over 5 million crashes which occurred from 2010-2015. Due to differences across state crash records, data are being harmonized using the Model Minimum Uniform Crash Criteria (MMUCC) guidelines. In addition to structured crash data, crash narratives were obtained for two states. Crash narratives provide additional information not traditionally entered as part of the structured crash data. They can aid in the identification and characterization of AFF crashes. Preliminary narrative analysis methods included both human review and machine learning algorithms. Human review included the development of a preliminary data dictionary and case categorization (e.g., AFF equipment, non-AFF equipment, and ambiguous). Next, machine learning algorithms, such as bigram, trigram, chord diagram, topic modeling, principal component analysis, and t-distributed stochastic neighbor embedding (t-SNE) were utilized to identify key words, clusters of crashes, and to explore AFF-related crashes. The upcoming year of the project will include analyzing the structured crash data to identify potential factors contributing to AFF crashes, as well as expanding the narrative analysis using more in-depth machine learning algorithms.