Annual Report

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Central States Center for Agricultural Safety and Health
University of Nebraska Medical Center
College of Public Health

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Center for Agricultural Safety and Health

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Central States Center for Agricultural Safety and Health
University of Nebraska Medical Center
College of Public Health
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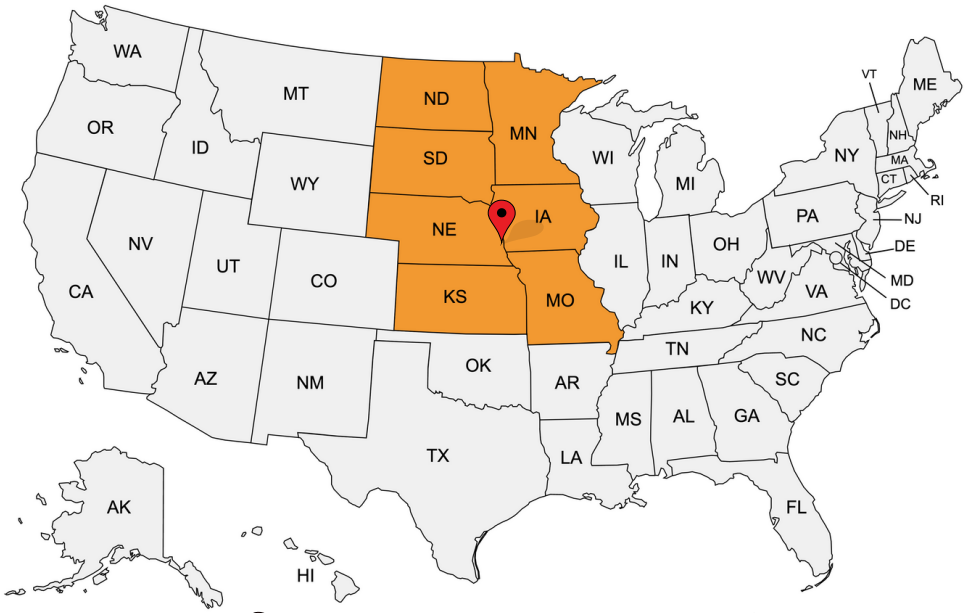

The CS-CASH is located at the University of Nebraska Medical Center in Omaha, Nebraska.

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Center Summary

The Central States Center for Agricultural Safety and Health (CS-CASH) conducts high quality research and translates scientific discoveries into practical applications to reduce the burden of injury and illness among farmers, ranchers, their families, and workers. CS-CASH, with a strong network of collaborators, provides regional leadership in research and outreach. Research teams from several states and institutions bring multi-disciplinary expertise and access to special populations. With our advisors and partners, we can leverage the Center's resources to address local, regional and national issues. CS-CASH has built a cohesive approach that links planning, evaluation, research, and outreach to reduce agricultural occupational injury and illness. The Center's Planning and Evaluation Core provides strategic direction, administration, and evaluation and it responds to emerging issues. The Research Core conducts basic, intervention, translation, and surveillance research. The Research Core also manages pilot/feasibility projects with substantial in-kind support from UNMC. The Outreach Core has a special emphasis on vulnerable populations: women, veteran farmers, immigrant workers, and Native Americans. Several Center projects address health and safety in feedyard and livestock production work, a major gap in previous efforts of the Ag Centers. CS-CASH has collaborative agreements with several other Centers to work on issues of mutual importance. CS-CASH is well established with a clear vision, mission, goals, organization, and service area.

Center Relevance

The Central States Center for Agricultural Safety and Health (CS-CASH) serves a highly productive agricultural region: North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, and Missouri. CS-CASH partners with NIOSH, other Ag Centers, agricultural stakeholders and works towards fulfilling our common mission to improve health and safety and reduce the burden of injury and illness in agriculture.

Key Personnel

Risto Rautiainen, PhD, MS	Center Director	rrautiainen@unmc.edu
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Eleanor Rogan, PhD	Pilot Program Director	egrogan@unmc.edu
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Ellen Duysen, MPH, COHC	Center Coordinator, Outreach	ellen.duysen@unmc.edu

Project Highlights

Improving Safety and Health in the Cattle Feedyard Industry
Aaron Yoder, PhD

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Mystera Samuelson, PhD

Surveillance of Agricultural Injuries
Risto Rautiainen, PhD

Evaluation
Cheryl Beseler, PhD

Pilot Project Program
Eleanor Rogan, PhD

Emerging Issues
Risto Rautiainen, PhD

Outreach Program
Debra Romberger, MD

Improving Safety and Health in the Cattle Feedyard Industry

Dr. Aaron Yoder

Project Aims

1. Develop and implement a comprehensive feedyard safety and health training program.

To accomplish this specific aim we will:

a) Review and develop bilingual training materials for a comprehensive feedyard worker safety and health training program;

b) Obtain qualitative information about the safety culture among feedyard managers and workers using the multi-sited ethnography method; and

c) Refine and implement the comprehensive safety and health training program at fifteen participating feedyards in Nebraska and the region.

1. Evaluate the efficacy of the comprehensive feedyard safety and health training program.

To accomplish this specific aim we will:

a) Evaluate the injury and illness experience in the beef production industry using existing and newly collected injury and illness information; and

b) Evaluate the effectiveness of the feedyard safety and health training in reducing the number and cost of injuries and illness and improving the safety culture on feedyards.

Significance

Feedyard work is dangerous work. In 2021-2022, the beef and cattle ranching and farming industries (including feedyards) recorded a fatal injury rate approximately five times higher than the agriculture, forestry, and fishing sector overall. Since 2012 research and outreach personnel at the Central States Center for Agricultural Safety and Health (CS-CASH) have been working to reduce the high rate of worker injuries and fatalities in feedyards. The objectives of this project were to develop a network of stakeholders and a program that improved the safety and health of feedyard workers, thereby reducing Workers' Compensation costs for participating feedyards.

CS-CASH Feedyard Safety Advisory Board 2021-2022

FSAB Advisor	Affiliation
Jo Bek	Nebraska College of Technical Agriculture
Kelly Bruns	Nebraska Extension
Meredith Cable	Nebraska College of Technical Agriculture
Mike Drinnin	Nebraska Cattlemen
Rob Eirich	Nebraska Beef Quality Assurance/NE Ext.
Dale Grotelueschen	Great Plains Veterinary Education Center
Susan Harris	Nebraska Extension
Joanna Hergenreder	Nebraska College of Technical Agriculture
Mike Keenan	Arthur J. Gallagher Co.
Steve Krull	Medicine Valley Vet Hospital
Jerry Kuenning	Nebraska Cattlemen Feedlot Council
Dan Lee	Agri-Services Agency
Barb Miller	Adams Land and Cattle
Tom Noffsinger	PAC DVMS
John Roberts	Nebraska Cattlemen
Nate Sawicki	Gottsch Feedyards
Norbert Schneider	Innovative Livestock
Aaron Spanier	Innovative Livestock
Dean Wilken	Nebraska Cattlemen Feedlot Council

Data Collection - Burden of Injury and Fatalities and Need for Safety Interventions

Conducting Ethnographic Research. To document and explore emerging issues on feedyards, Dr. Ryan Klataske and Dr. Casper Bendixsen use a rapid multi-sited ethnographic approach to research involving interviews and participant observation. This research involves visiting multiple feedyards, participating in related events, and interviewing and interacting with a wide range of individuals, including workers, managers, workers' compensation experts, and other stakeholders. This research explores multiple areas of feedyard operation and incorporating a diversity of voices to understand better the experiences, perspectives, and needs of workers related to safety and health. which will help to facilitate future research. Feedyards were recruited for ethnographic research through recommendations from the Advisory Board and recruitment at Cattlemen's conventions and other industry meetings.

Survey of Feedyard Managers and Workers. A survey of feedyard managers, safety trainers, and operators was conducted to determine the cattle feeding industry's safety training practices and preferences. We found that only half of respondents had dedicated safety personnel; however, there was interest in a safety training program conducted through short hands-on and in-person methods with materials available in English and Spanish. The majority of participants were also interested in a feedyard safety certification program. Participants reaffirmed the importance of partnering with industry and other stakeholders when conducting these programs. These results were published (Ramos, Duysen, Yoder 2019) and used to guide the development of feedyard safety training modules and the corresponding recognition program for feedyards and feedyard workers as part of the "Improving Safety and Health of Cattle Feedyard Workers" project.

Data from Project Partners - Workers' Compensation and Descriptive Injury Information. An essential partner in this research, and member of the FSAB, is Mike Keenan, the loss prevention expert at Gallagher Insurance Company. Gallagher Insurance represents Agri-Services Agency (ASA), one of the largest insurers of feedyards in the U.S. Mr. Keenan has provided valuable baseline injury and cost data from feedyards in the form of Workers' Compensation claim data and internal insurance cost analysis. ASA uses these data to set the feedyard's Workers' Compensation costs. For this study, these data are valuable to determine the burden of injuries (example: employee's days lost off work, type and extent of injury, overall rates of injury by source) and determine if safety training and interventions can reduce these rates. Feedyards enrolled in the project intervention arm were all insured by ASA, thereby ensuring access to these valuable data. An example of the unpublished data provided by ASA to CS-CASH researchers is shown below.

Cause of Injury	Number Injured	% of Total Injuries	Median Cost ($)	Maximum Cost ($)
Animal	129	31.9	749	187,207
Falls, slips, trips	62	15.3	1,967	99,948
Machinery	25	6.2	1,455	81,005
Struck by object	14	3.5	1,341	145,145
All other causes	97	24.0	913	5,727,123
Cause unknown	77	19.1	445	215,066

Data from existing and newly collected injury and illness information. In addition to collecting insurance data on feedyard injuries and fatalities, data is collected yearly from the Bureau of Labor Statistics, the CS-CASH Injury Surveillance project, and the CS-CASH News Clip Service, thereby providing robust data for the feedyard project, information on emerging issues, and data for use in educational resources.

Research Methods and Outcomes: Feedyard 15 Training

Feedyard 15 Training Topics:

1. Slips Trips and Falls
2. ATVs/UTVs
3. Feedmill Safety
4. Mobile Equipment/Autos
5. Tractor/Loader
6. Cattle Handling/Stockmanship
7. Processing Cattle
8. Horsemanship
9. Emergency Response
10. Extreme Weather
11. Chemical Hazards
12. Machine Shop Hazarads
13. Electrical Hazards
14. Bunker Silos/Silage Piles
15. Manure Lagoons

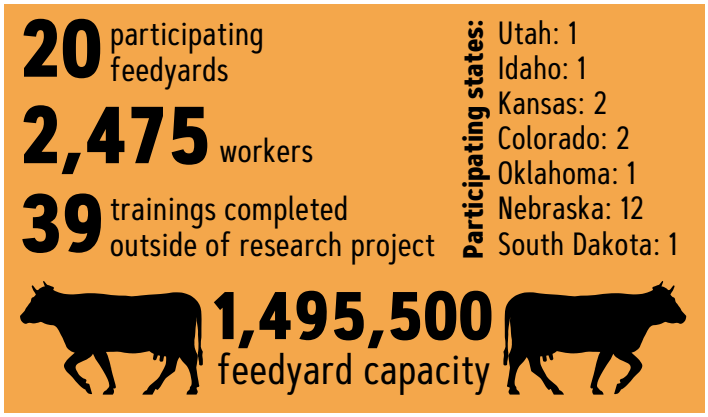
The Feedyard Safety Project team and a panel of content experts developed 15 training modules (Feedyard 15) that were subsequently used for training on 21 intervention ASA-insured feedyards. Feedyards and workers completing training receive commendations. After the research project, Workers' Compensation claims, injuries, and fatalities will be analyzed using baseline data. Intervention data will be compared to the control group, ASA-insured feedyards not enrolled in the training program.

Development of the English and Spanish Language Feedyard 15 Training Modules. Using Workers' Compensation data from ASA, the research team determined the 15 most hazardous jobs, processes, and equipment on the feedyard and developed these into 15 PowerPoint presentations with comprehensive training dialogues attached in the presenter section of the slides. Training resources are included with each training. Handouts are available of each module along with supplementary resources.

Content experts were paid to create content for the modules. Each module is created on a standardized template with regionally appropriate images and consideration for literacy levels. Each module has been translated into Spanish by a Spanish-speaking safety expert. Translations are verified by the project coordinator, who is proficient in Spanish. Included at the end of each module is a 10 question "learning" quiz that can be used to test comprehension and reinforce learning. Each module was reviewed by the CS-CASH research team prior to release and is evaluated by the Feedyard 15 trainers after use.

Supplemental Modules. In response to feedyard incidents or needs to train on a particular topic, additional modules were requested by the Feedyard 15 trainers. The following modules were created and added to the Feedyard 15 curriculum – managing chronic health conditions, fatigue, pain, and alcohol.

Customized Modules. Feedyards can customize the modules by requesting additional content, customized images, feedyard logos, or other modifications that are approved by the research team.



Trainers. Upon request, trainers for the Feedyard 15 modules may be provided by the Feedyard Safety Research team, including a Spanish-speaking training trainer. Many of the larger feedyards have an employee designated as a safety trainer. This individual will conduct the training, documentation, and evaluation of the modules. A third alternative is to have the feedyard's Gallagher Insurance safety professional conduct the training. A number of the feedyards have used this option.

Gallagher has worked with the Feedyard 15 project since the beginning of the grant program. As a risk control consultant with Gallagher, I have used the program for each of my feedyard accounts to help train them on hazards and risks around the yard. Employees have given feedback and learned how their safety is impacted by the way they work around cattle. I have over 20 accounts that use this program and the training materials to train their workers in English and Spanish. It has been very successful in starting conversations among workers and talking about the resources that are offered in the interest of safety.

The most significant success I have had with the program thus far is when I started training a yard that had a high frequency of claims and was not completing any safety training up until their insurance carrier recommended it. Gallagher used the Feedyard 15 program as a perfect method to train their workers. As a result of doing the program for one year, their insurance cost has decreased by 5% and their claims count has been zero since the start of the program. As a result, this has saved the client nearly $20,000 in cost.

It is clear to me that the Feedyard 15 project has made a big impact on my clients and the safety culture of the yards. As we continue to grow the project modules and expand the resources available through the project, I'm excited to see what's ahead for agricultural safety on feedyards in particular. I know the project has helped all 20 of my accounts think about safety differently and has taught me what exposures need to be paid closer attention to when protecting workers.

Additional Resources Developed

During the project, the feedyard safety team developed resources for all feedyards.

- Many of these resources are housed on the Feedyard Worker Safety Website: https://www.unmc.edu/publichealth/feedyard/.
- A Flickr Feedyard Photo Site was created to provide photos to safety professionals and the public in educational materials and on social media. These high-quality photos are copyright-free and provided free of charge: https://www.flickr.com/photos/cscash/albums/72157708569289865.
- To supplement Spanish language safety resources, Spanish language resources for feedyard safety training are available on the CS-CASH website: https://www.unmc.edu/publichealth/cscash/resources/spanish-resources.html.

This project has significantly expanded the current knowledge of injury characteristics and burden of injury and employer and employee views regarding injury prevention on feedyards. The project team collaborated with industry and insurance partners to create a new evidence-based program model that can be implemented widely in the cattle feedyard industry. An evaluation of the effectiveness of the feedyard safety and health training program to reduce the number and cost of injuries and illnesses and improve the safety culture on participating feedyards is forthcoming.

The CS-CASH Feedyard Worker Safety Team looks forward to continuing innovative, impactful work proposed for the 2022-2027 NIOSH Ag Center funding cycle.

FY 11 Publications

Eisenhauer CM, Brito FA, Yoder AM, Kupzyk KA, Pullen CH, Salinas KE, Miller J, Hageman PA. (2020). Mobile technology intervention for weight loss in rural men: protocol for a pilot pragmatic randomised controlled trial. BMJ Open. 10(4):e035089. doi: 10.1136/bmjopen-2019-035089

Olowogbon TS, Babatunde RO, Asiedu E, Yoder AM. (2021). Prevalence and exposure to ergonomic risk factors among crop farmers in Nigeria. Applied Sciences. 11:11989. doi: 10.3390/app112411989

Ramos AK, Suraj A, Rautiainen R, Yoder A. (2022). Protecting cattle feedyard workers in the Central States region: Exploring state, regional, and national data on fatal and nonfatal injuries in agriculture and the beef production sector. Journal of Extension. 60(3):13.

Watanabe-Galloway S, Chasek C, Yoder AM, Bell JE. (2022). Substance use disorders in farming population: Scoping review. Journal of Rural Health. 38(1):129-150. doi: 10.1111/jrh.12575

Wickman A, Duysen E, Cheyney M, Pennington W, Mazur J, Yoder A. (2021). Development of an educational YouTube channel: A collaboration between U.S. Agricultural Safety and Health Centers. Journal of Agromedicine. 26(1):75-84. doi: 10.1080/1059924X.2020

Health and Safety Risks Among Immigrant Cattle Feedyard Workers

Dr. Athena Ramos

Project Aims

1. Systematically explore and describe the health status and occupationally related risks among Latino immigrant cattle feedyard workers in Nebraska and Kansas;
2. Test the Ecological Stress-based Model of Immigrant Health and Safety, which predicts if workers' intrapersonal mechanisms (i.e., stress appraisal, ethnic identity, and cultural values) mitigate culture-related occupational stress and negative health outcomes; and
3. Review, develop, evaluate, and disseminate bilingual (English/Spanish) health and safety and policy materials designed specifically for cattle feedyard operations.

Data Collection

Our team completed data collection with a total of 243 research interviews with immigrant cattle feedyard workers in both Nebraska and Kansas.

Significant Research Findings

Alcohol Use & Occupational Injury. Alcohol abuse is a significant public health issue and is a leading cause of preventable death in the United States. We found that there are high rates of alcohol use and hazardous drinking among Latino immigrant feedyard workers. Agricultural employers should acknowledge the potential impact of alcohol on workplace safety and take steps to mitigate its negative consequences. Culturally, linguistically, gender-tailored, and literacy-appropriate health education and consistent screening for alcohol use are needed in primary care and community-based settings.

Fatigue & Need for Recovery. We found that those workers with fewer number of years on cattle feedyards, having a lower education, experiencing physical pain, and increased job demands were directly related to heightened mental fatigue. Being female, experiencing physical pain, an elevated average of hours worked per day, increased job demands, and less decision latitude were directly related to an increased need for recovery.

Immigration-Related Fear Among Workers. Nearly 50% of workers reported knowing someone who had been threatened with deportation, and 26% reported that Immigration and Customs Enforcement (ICE) agents had visited family, friends, or neighbors. Many reported that ICE had conducted raids at businesses where family and friends work. Nearly a quarter of workers reported that hostile or harmful laws directed towards Latinos had been passed in their local community. Immigration enforcement activities have created a climate of fear among agricultural workers, and there was a significant negative association between ICE visits and workers reporting feeling that their family was safe. In addition to the stress this creates for workers and their families, this has implications for health and safety research and practice, such as for engaging with immigrant participants, developing appropriate community partnerships, and conducting education and outreach activities.

Job Safety Training. Approximately 25% of workers reported that they had not received any health or safety training from their current employer, and only about 9% had ever participated in any OSHA safety training program. Videos, in-person training, or shadowing another worker were the most frequent methods of safety training reported by those who had received training. More than 93% were interested in receiving more information about health and safety related to their job. Workers preferred that safety information be provided through in-person training at the job site, videos (particularly those accessible through media sources such as YouTube), and written materials. Specific topics that workers were interested in obtaining more information about included zoonoses, low-stress cattle handling, injury prevention, hazard and injury reporting, chemical and equipment safety, and teamwork. Furthermore, a majority of participants preferred to receive information in Spanish, and some noted that language accessibility prevented them from looking for health and safety resources for themselves.

Because there are numerous inherent risks on cattle feedyards, creating an environment that highlights management's commitment to safety and engages workers in safety may lead to better long-term outcomes.

Occupational Injuries. Nearly three-fourths of participants (71.2%) reported having experienced one or more injuries in the past while working on a cattle feedyard. The most frequent types of reported injuries, including those not requiring medical care, were bruises/contusions (40%), cuts/lacerations (21%), and sprains/strains (12%). These injuries were mainly caused by animals/livestock (33%), chemicals (23%), falls (12%), and tools (9%). Significant risk factors for injury included male gender, being over age 35, working on a large or an extra-large feedyard, having 11 or more employees on the feedyard, and working more than eight hours a day.

Work Safety Climate on Cattle Feedyards. A majority of workers reported that taking risks was part of their job, and over 67% believed that their employer could do more to make their job safer. More than 93% of workers believed that it was likely that they would be injured in the next 12 months at work.

Creation of Educational Resources

Resources can be found at https://www.unmc.edu/publichealth/cscash/feedyard/index.html.

We developed a series of educational resources for Latino immigrant cattle feedyard workers:

1. "Know your Rights" bilingual flyer for cattle feedyard workers in Nebraska that discusses safe working conditions, how to report unsafe conditions, discrimination, and immigration concerns.
2. Bilingual cattle feedyard picture glossary that is currently being finalized and prepared for dissemination.
3. Four supplemental modules (including PowerPoint slides, speaker notes, quiz questions) for the Feedyard 15 program on fatigue, alcohol use, managing chronic conditions, and dealing with pain. These modules are available in both English and Spanish.
4. Translated CS-CASH educational resources: https://www.unmc.edu/publichealth/cscash/resources/spanish-resources.html.

COVID-19 Resources

We developed two bilingual COVID-19 feedyard infographics – one related to COVID-19 prevention at work and the other related to coping with anxiety and stress related to the pandemic. These infographics were disseminated widely through social media reaching almost 65,000 people.

Dissemination of Research and Resources

We conducted social media campaigns on Facebook, Twitter, and Instagram focused on agricultural workers for National Farm Safety Week and Hispanic Heritage Month. We also published 6 scholarly publications, conducted 32 conference presentations, presented 8 invited lectures, and used traditional media outlets.

FY11 Publications

Beseler CL, Crawford KJ, Charlier DE, Ramos AK. (2021). The NIOSH agricultural centers' YouTube channel: Time series modeling of viewership of agricultural health and safety videos. Journal of Agromedicine. 27(4):368-377. doi: 10.1080/1059924X.2021.2000907.

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Haws JK, Andrews AR III, Acosta Canchila MN, Ramos AK. (2022). Refining the Migrant farmworker Stress Inventory among Latino migrant farmworkers in rural Nebraska. Journal of Rural Mental Health. 46(2):100-116 https://doi.org/10.1037/rmh0000202

Herstein JJ, Degarege A, Stover D, Austin C, Schwedhelm MM, Lawler JV, Lowe JJ, Ramos AK, Donahue M. (2021). Characteristics of SARS-CoV-2 Transmission among Meat Processing Workers in Nebraska, USA, and Effectiveness of Risk Mitigation Measures. Emerging Infectious Disease. 27(4):1032-1038. doi: 10.3201/eid2704.204800.

Ramos AK, Carvajal-Suarez M, Trinidad N, Quintero SA, Molina D, Johnson-Beller R, Rowland SA. (2021). Health and well-being of Hispanic/Latino meatpacking workers in Nebraska: An application of the Health Belief Model. Workplace Health & Safety. Jun 25;21650799211016907 doi: 10.1177/21650799211016907

Ramos AK, Carvajal-Suarez M, Trinidad N, Quintero S, Molina D, Rowland SA. (2021). "No somos máquinas" (We are not machines): Worker perspectives of safety culture in meatpacking plants in the Midwest. American Journal of Industrial Medicine. 64(2):84-96. doi: 10.1002/ajim.23206 PMID: 33284493

Ramos AK, Girdžiūtė L, Starič J, Rautianinen RH. (2021). Identifying "vulnerable agricultural populations" at risk for occupational injuries and illnesses: A European perspective. J Agromedicine. 26(3):340-345. doi: 10.1080/1059924X.2020.1771498

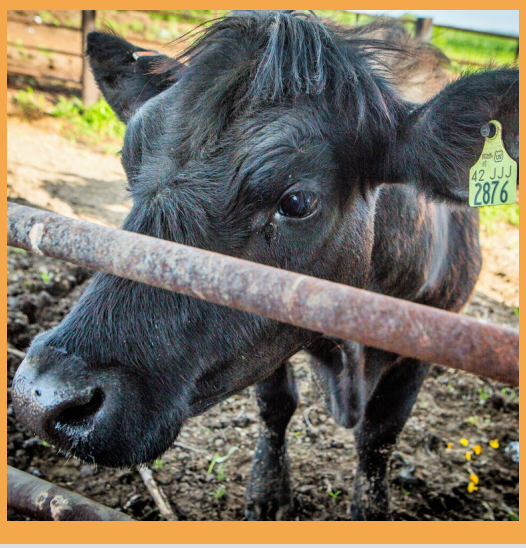
Ramos AK, McGinley M, Carlo G. (2021). The relations of workplace safety, perceived occupational stress, and adjustment among Latino/a immigrant cattle feedyard workers in the United States. Safety Science. 139:105262.

Ramos AK, Suraj A, Rautiainen R, Yoder A. (2022). Protecting cattle feedyard workers in the Central States region: Exploring state, regional, and national data on fatal and nonfatal injuries in agriculture and the beef production sector. Journal of Extension. 60(3):13.

Reyes S, Acosta LM, Domínguez V, Ramos AK, Andrews AR, III. (2022). Immigrant and U.S.-born migrant farmworkers: Dual paths to discrimination-related health outcomes. American Journal of Orthopsychiatry, 92(4), 452–462. https://doi.org/10.1037/ort0000625

Rowland SA, Ramos AK, Carvajal-Suarez M, Trinidad N, Johnson-Beller R, Struwe L, Quintero SA, Pozehl B. (2021). Musculoskeletal pain and cardiovascular risk in Hispanic/Latino meatpacking workers. Workplace Health & Safety. 69(12):556-563. doi: 10.1177/21650799211016908.




Agricultural Dust-Induced Airway Injury and Repair: An IL-10 Centered Approach

Dr. Todd Wyatt

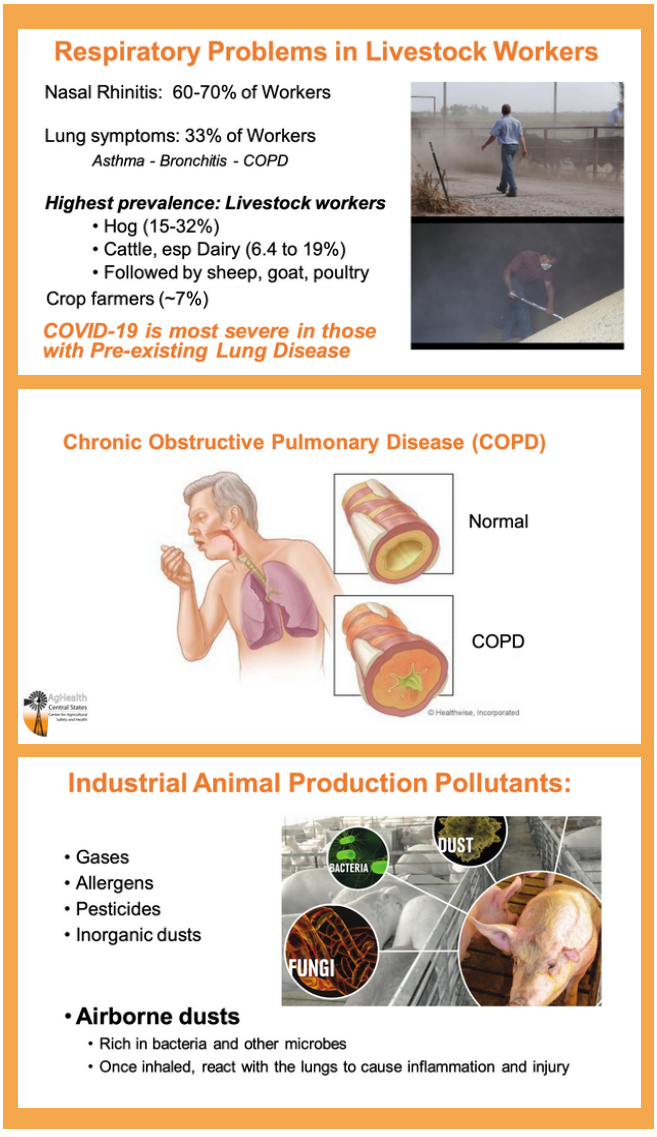
Project Aims

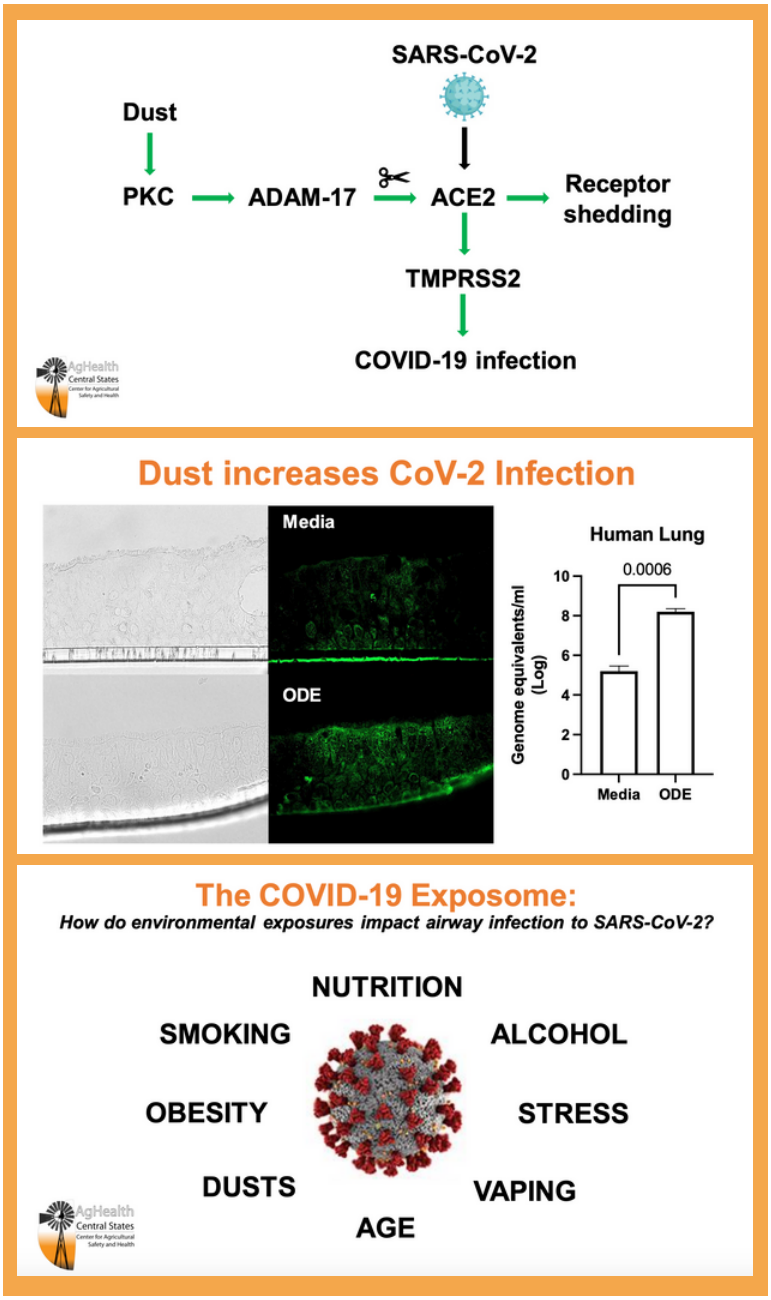
1. Characterize the role of IL-10 in governing the post-inflammatory homeostasis repair and recovery response in an animal model of agriculture organic dust-induced airway injury.
2. Identify the mechanism(s) of scavenger receptor A (CD204) in regulating the IL-10 response to agricultural dust using in vitro cell models and in vivo animal models.
3. Determine the relationships between systemic IL-10 levels, IL-10 pathway genetic polymorphisms, and pro-inflammatory cytokine hyper-responsiveness in persons with prior agricultural exposure.

Accomplishments

We have completed all three aims and published 40 peer-reviewed manuscripts and 55 abstracts/presentations related to the project. By creating a novel murine model of agricultural dust-induced inflammatory lung disease incorporating ovalbumin induced allergy in mice, we are now able to examine allergic inflammation in the context of the agricultural occupational dust environment. We have now published this work in the journal Respiratory Research.

We have made significant progress into the mechanisms of agricultural dust-mediated injury. We have begun evaluating the impact of dietary zinc in dust mediated lung inflammation through exploiting a murine model of zinc deficiency through the zinc transporter (zip8) knockout mouse. We are proceeding with our studies of lung repair and recovery through examining the amphiregulin response to dust injury in lung. These studies have resulted in a new extramural grant award (Dept of Veterans Affairs I-01) to our CS-CASH co-investigator, Dr. Debra Romberger.





Importantly, we completed Aim 3 of our project in studying the impact of IL-10 in response to agricultural exposure in humans in order to move our laboratory findings from the mouse model in translation to clinical relevance. In addition, new findings suggest that macrophages from CD204 knockout mice have a diminished cAMP/PKA pathway of IL-10 stimulated anti-inflammation than normal wild type mice. Furthermore, our dust related studies have now established a link between lung injury and arthritis. These studies have led to a new extramural grant award to Dr. Jill Poole (NIOSH R-01).

This project laid the groundwork for our new research utilizing the NIOSH Exposome Model. We are now examining the sum of all exposures through the course of aging to evaluate the impact of agricultural organic dust on lung injury and repair. In pursuit of this, we are now studying the role of environmental and behavioral exposures such as cigarette smoking, zinc deficiency, and alcohol use as exposome modulators of the lung response to inhaled dust. Furthermore, we are currently responding to the COVID-19 crisis by examining the role of agricultural environment dust exposure on COVID-19 susceptibility and severity. These studies have led to two new extramural grant awards to Dr. Todd Wyatt (NIOSH U54 Project 1 and NIAAA R-01).

Summary of Impact

We anticipate that our studies could ultimately lead to improved approaches to impact respiratory disease burden in affected workers. Our studies are the first to focus on the repair and recovery response following agricultural exposure-induced airway injury.

FY 11 Publications

Bailey KL, Samuelson DR, Wyatt TA. (2021). Alcohol use disorder: A pre-existing Condition for COVID-19? Alcohol. 90:11-17. doi: 10.1016/j.alcohol.2020.10.003.

Ding L, Tang S, Wyatt TA, Knoell DL, Oupicky D. (2021). Pulmonary siRNA delivery for lung disease: Review of recent progress and challenges. Journal of Controlled Release. 330:977-991. doi: 10.1016/j.jconrel.2020.11.005

Ding L, Tang W, Mosley DD, Yu A, Sil D, Romanova S, Bailey KL, Knoell DL, Wyatt TA, Oupicky D. (2022). Perfluorocarbon nanoemulsions enhance therapeutic siRNA delivery in the treatment of pulmonary fibrosis. Advanced Science. Jan 7;e2103676. doi: 10.1002/advs.202103676

Hall SC, Smith DR, Dyavar SR, Wyatt TA, Samuelson DR, Bailey KL, Knoell DL. (2021). Critical role of zinc transporter (Zip8) in myeloid innate immune cell function and the host response against bacterial pneumonia. The Journal of Immunology. 207(5):1357-1370. doi: 10.4049/jimmunol.2001395

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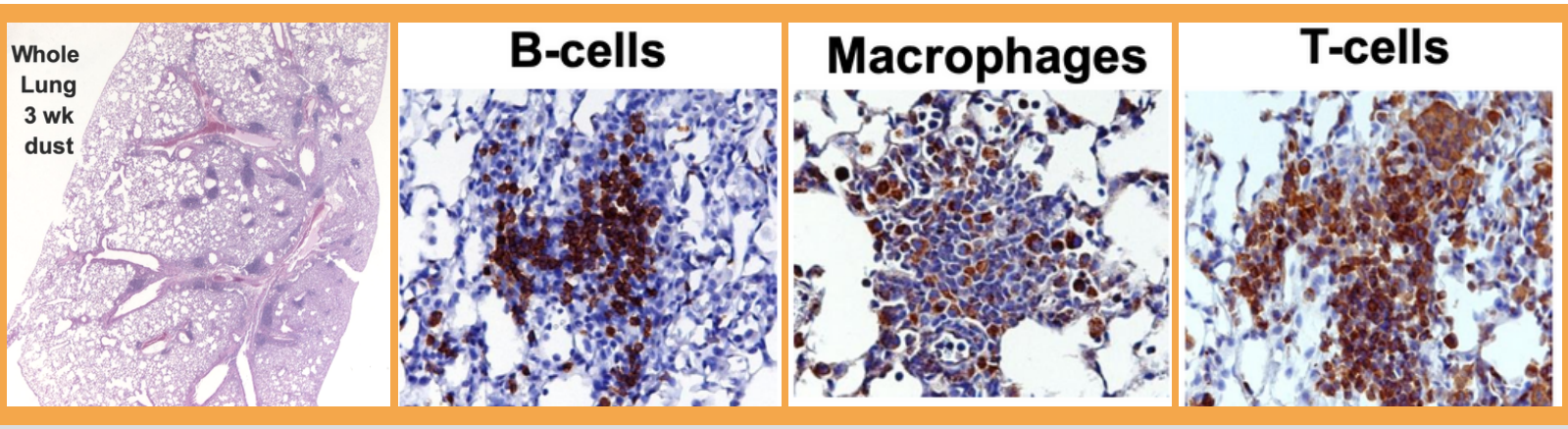


Increasing Personal Protective Equipment Use by Point Source Protection Strategy

Dr. Chandran Achutan

Project Aims

1. Assess the participants' baseline PPE use and exposures as potential targets for intervention.
2. Conduct a randomized controlled trial to test is the Point Source Protection Strategy (PSPS), placing customized PPE boxes near targeted exposures, increases PPE use.
3. Evaluate the feasibility and demand for the Point Source Protection Strategy (PSPS) and PPE boxes.

Significance

Agricultural work involves numerous injury and illness hazards; exposure to dust can lead to respiratory dysfunction, chemical and pesticide exposures can lead to skin disorders, eye injuries, and cancer, and excessive noise can result in noise induced hearing loss. While considered the 'last resort' in prevention, use of personal protective equipment (PPE) is often necessary to reduce hazardous exposures. In agriculture, exposure sources are spread out in numerous buildings, machinery, and outdoor working areas. Having easy access to PPE when and where needed becomes a challenge even if workers are motivated to use them. We developed an innovative 'point source protection strategy (PSPS)' and successfully tested it for hearing protection devices (HPDs), where HPDs were placed in weatherproof boxes next to sources of loud noise. We found that farmers increased their use of HPDs when they were conveniently placed where needed. HPD boxes reminded them to wear HPDs. However, participating farmers were also concerned about their respiratory, eye, and skin protection, and uncertain what PPE are appropriate for different work situations.

In this study we evaluated exposure sources and current PPE use in a systematic process, using the validated Certified Safe Farm checklist. We placed customized PPE storage boxes that held combinations of PPE including HPDs, respirators, gloves, and eye protection, selected to meet the protection needs at different work sites.

1. Farm Recruitment & Enrollment

Farm	Enrolled	Participants
Intervention	19	27
Control	19	26
Totals	**38**	**53**

Farm Hazard Assessment

PPE Usage Questionnaire. Baseline PPE use indicated only 28% of farmers use PPE every time they believe it is needed. PPE questionnaire results indicated gloves and respirators as the most common protection used by farmers (85% and 74% respectively). Dual cartridge respirators, and/or respirators with shields were the least likely PPE item used at 8% followed by hearing protection devices. While respirators were cited as the most common PPE used by farmers, upon investigation researchers discovered many farms were using surgical masks or non-NIOSH certified respirators.

Certified Safe Farm Review. A farm walkthrough was completed with the participant to identify comprehensive on-farm exposures and hazards. During this walkthrough, participants were able to discuss with researchers what farm tasks, equipment, and exposures they identified as being potentially harmful to their health. This process helped prioritize and specialize what type of PPE would be most useful to each farm, and locations for PPE box placement at intervention farms. Exposure

Measurements. Exposures including noise, ammonia and dust levels were assessed and measured on farms which researchers were unsure of the risk, and thusly what level of personal protection was needed. Samples for ammonia and dust were measured at two different confined animal feeding operations following NIOSH method 6016 and NIOSH method 0500. Noise dosimeters were used to sample sound of various farm machinery and equipment.

PPE Disbursement. All farms enrolled have been visited twice and received PPE, educational materials, and PPE use training. Regardless of farm status, each farm received some form of respiratory protection, hand protection, eye protection, and hearing protection device.

2. Personal Protective Equipment Totals

Farm	Respirators	Gloves	Earmuffs	Earplugs	Eye Protection
Intervention	765	161	55	1901	130
Control	386	99	46	1700	107
Totals	**1151**	**260**	**101**	**3601**	**237**

Point Source Protection Strategy. Using a PSPS, customized PPE boxes were installed near targeted sites of exposure. A total of 63 PPE boxes were installed at 19 intervention farms. Table 3 represents boxes placed at targeted high exposure sites. Boxes installed at "other" locations included semi-trucks, irrigation wells, and other farm vehicles. PPE provided to each box was relevant to the box locations exposure sources.

3. Exposure Areas of PPE Box Install

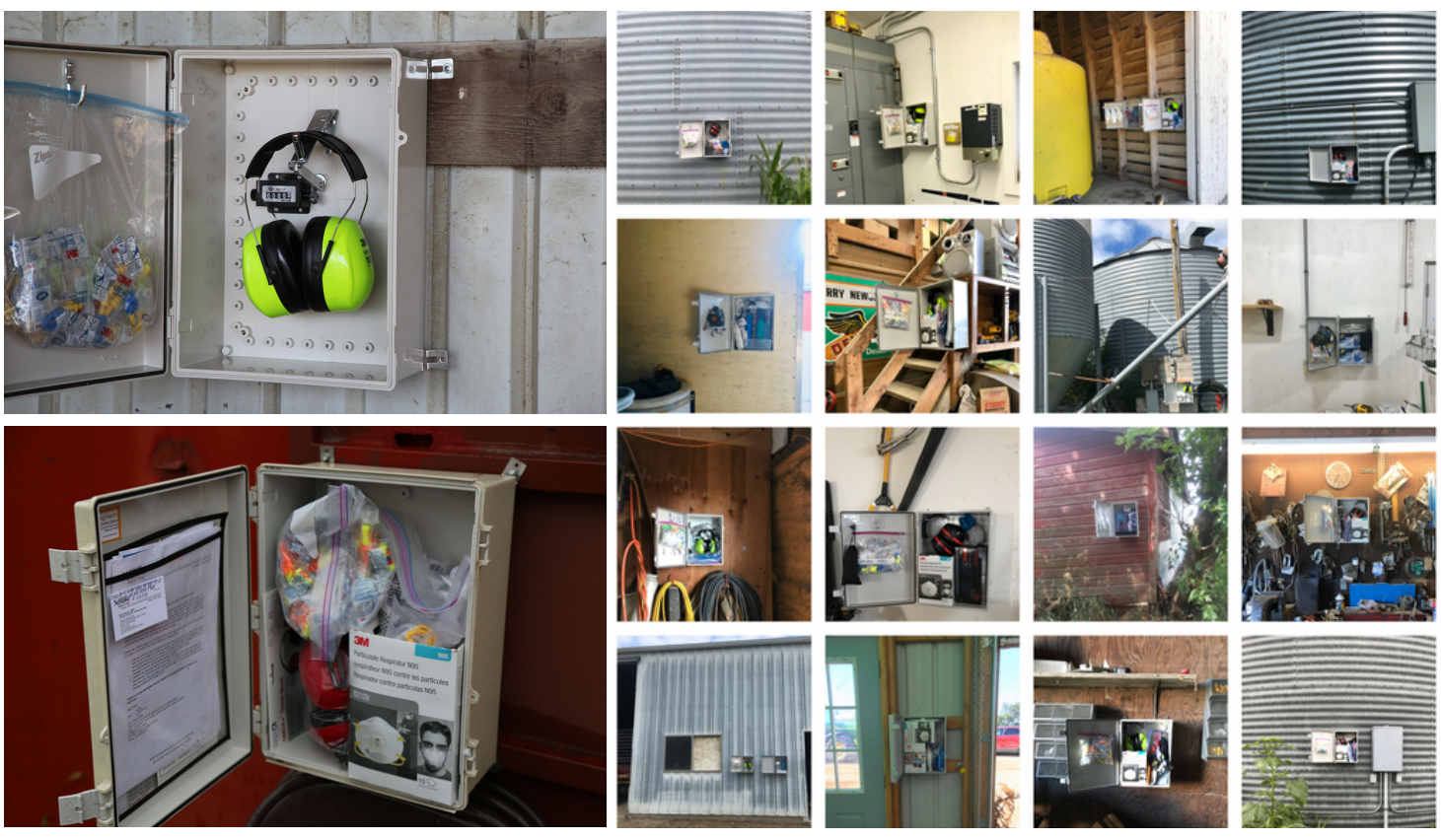
Location	Quantity
Grain Bin/Elevator	18
Machine Shop	25
Chemical Storage	10
Livestock	5
Other	5
Total	63

Education. The needs assessment during visit one helped to inform the type of education and training provided to participants at visit two. Every participant was provided with information on hearing loss prevention and respiratory protection. If participants were provided with different types of respirators (i.e., N95, P100, R95), sufficient time was spent discussing the appropriate environments in which to wear different respirators and how to maintain and properly store respirators. Other educational resources and information on the following topics were provided to participants upon their request: pesticide disposal; manure pit dangers, hazards, and monitoring; safe play spaces for children on the farm; flood relief.

Training. Intervention and control farmers were provided training on the appropriate use and maintenance of the PPE provided. The training consisted of demonstrating the correct use and maintenance of the PPE and included a transfer of knowledge component where farmers were asked to demonstrate to the research team the correct way of using PPE such as earplugs and respirators. Qualitative respirator fit tests were also provided upon request.

PPE Use Evaluation

Collection of PPE use was ongoing and collected quarterly in October, January, April, and July months. Preliminary analysis of the data indicates respirator and ear protection use among intervention participants was greater during the summer and fall seasons (≤ 90 %). Data collected during the winter season quarter indicates a reduction in the use of ear plugs, respirators, safety glasses, and gloves. Reasons cited by participants for non-use included: forgetting to use and not needing to use PPE. Some participants indicated not needing to use PPE during the winter season for reasons of travel.



PSPS Box Evaluation On Farms

During the Spring-Fall of 2021, researchers re-visited both intervention and control farms to replenish PPE supplies. Upon inspection of PPE boxes, there was no apparent damage externally or internally to the contents inside the PSPS box. PSPS boxes were proven to be effective at keeping moisture, dust, insects, etc. from entering the box and thus contents inside. Participants were generally surprised at how well PSPS boxes held up over the course of the project being exposed to the elements.

PSPS Concept Feasibility and Demand

Due to the COVID-19 pandemic, the objectives of specific aim III had to be amended. Participants enrolled in the PSPS study provided verbal feedback from their participation in the study. To gauge external feedback, feasibility, and demand of the PSPS product concept among two groups – emerging farmers and current farmers. Survey questions were designed using the theory of planned behavior intent to purchase. Descriptive analysis indicated 94% of farmers thought the PSPS boxes could be useful on their farm. One out of four farmers indicated they would be very interested in owning a PSPS product. Nearly half of those surveyed (48%) indicated they would probably buy the PSPS product if it were currently available in their local store.

The second group surveyed were emerging farmers – those enrolled in the National Safe Tractor and Machinery Operation Program. Youth in this training were also presented the PSPS box while engaged in PPE safety training. This group provided qualitative feedback on the concept and feasibility of the PSPS box including the following comments: "I think they're a great idea and should become something you find on every farm. It needs to be everywhere just like first aid kits"; "I think they could be useful just people might not put stuff back"; "they are a great idea; I think everyone on a working operation would benefit from them."; "make it a bright colored box". Although both groups were convenience samples, they provided honest, valuable feedback on the applicability of incorporating PSPS boxes into agricultural operations.

Lastly researchers met with an insurance agency which primarily provides policy to agricultural operations. This meeting provided insight into the feasibility of incorporating PSPS boxes on farms. The consensus was bringing the PSPS box concept to scale on large agricultural operations would be challenging due to the variation on sizes needed for the quantity of employees and locations of boxes. PSPS boxes may be better suited for smaller family operated farms than larger farms. Work will continue on development of this concept of providing PPE at the source of the hazard.

FY 11 Publications

Farfalla AA, Beseler C, Achutan C, Rautiainen R. 2022. Coexposure to solvents and noise as a risk factor for hearing loss in agricultural workers. Journal of Occupational and Environmental Medicine. 64(9):754-760. doi: 10.1097/JOM.0000000000002571

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Enhancing the Health and Safety of Range Bison Herd Workers

Dr. Mystera Samuelson

Project Aims

1. Characterize injuries and hazards associated with working bison under contemporary conditions on tribal reservations and on non-reservation facilities.
2. Develop and implement intervention strategies to mitigate worker safety risks.
3. Assess outcomes and impacts of intervention strategies.
4. Disseminate updated intervention strategies widely to bison herd managers and workers.

Significance

Increase in North American Bison Herd Numbers.
Bison production is attractive to many producers in the semi-arid central state's region as an alternative agricultural enterprise for numerous reasons. American bison are incredibly hardy animals that can survive winter blizzards and extreme summer heat, allowing them to thrive on ranges which are not capable of sustaining domestic cattle. Bison are efficient to raise as they are low maintenance, resistant to most parasites, and are very efficient grazers. Bison are also long-lived animals with a reproductive cycle that can exceed 20 years. Calving occurs in late spring with easy births, producing calves that are very hardy, and need little assistance. Consequently, the bison industry is growing in the central states region. In the 2017 USDA (United States Department of Agriculture) census, there were 362,406 bison in North America, with an estimated 20,000 on tribal lands. These numbers represented a significant increase from 1900 when an estimated 1,000 bison remained in North America.

Bison Worker Safety Risks and Hazards. Handling bison during the annual roundups, medical treatment, and processing entails close contact with animals that often become aggressive and dangerous. High-stress bison handling methods can result in animals considering workers a threat. Bison are not used to the amount of human interaction that other domestic cattle experience; thus, working bison is stressful to both the animals and workers. As a result, injuries to workers or animals may occur. Worker safety hazards may also arise from the use of substandard facilities and equipment such as dysfunctional squeeze chutes; alleyways that are

No barrier to protect workers from bison exiting chute

Rugged terrain may be encountered during roundups

either inappropriately designed for such large animals or are in disrepair; lack of gate closure safety chains; and absence of worker safety barrier fences. Adverse environmental conditions, such as dangerous terrain, dust, or slippery surfaces due to ice or mud, may also contribute. Lack of training and use of unskilled workers presents an additional level of risk on tribal properties. In our worker safety pilot project, 40% of herd managers indicated that they had witnessed worker injuries.



Examples of facility repair needs: Unsafe gate and ladder.

Research Results, Outcomes, and Impact Aim 1

We developed a Workplace Safety Assessment checklist using the Certified Safe Farm (CSF) general checklist and the CSF dairy and beef checklist as models. This checklist was designed to assist researchers in documenting hazardous working conditions and facility conditions. Photos were taken at each site to visually reference the reports shared with the herd manager. Scoring on the first visit provided a baseline for return visits, allowing us to document facility upgrades, repairs, or improved safety practices. We developed additional forms for injury data collection containing OSHA (Occupational Safety and Health Administration) 300 log information, pertinent questions from the CS-CASH injury survey, and specific questions to characterize incidents in working with bison. Our team used this tool to conduct on-site assessments. Assessment of the hazards in animal handling is based on industry standards: use of electric prods, collision with headgate, chute exit speed, injury, and crowding. Data from observations in the field were recorded on the paper forms for later entry into electronic databases. Assessments were made during on-site visits to tribal and non-tribal handling facilities, preferably, but not always when workers were in the process of working bison. Assessment forms were left with herd managers during the first site visits. Forms were also sent to managers at additional tribal sites and non-tribal sites. Managers were asked to record all injuries and keep the forms on file until the next site visit.

Observational Assessment Findings. (Tribal and non-tribal sites) Injuries to personnel working bison were observed and recorded. Bison handling deficiencies were recorded and included unsafe approaches to rounding up bison and inadequate bison confinement practices. Equipment deficiencies included faulty ready chute design, lack of safety barrier fence, poorly maintained and dysfunctional squeeze chutes, high-stress bison handling practices. Practice resulted in animal injuries.

Reports to Herd Manager. We prepared reports following site visits. Items included a summary of observations (reporting safe and unsafe conditions and equipment), the observational score sheet, and photos of safety or health issues that needed to be addressed. Improvements from previous visits were noted.

Observational Report Locations. We conducted assessments at the bison herd handling sites - tribal locations: Standing Rock, Fort Peck, Slim Buttes, Taos Pueblo, Sinte Gleska University, Rosebud Sioux, and non-tribal locations: Wind Cave National Park, Konza Prairie (Kansas State University), Neal Smith Wildlife Refuge, Theodore Roosevelt National Park, Niobrara Valley Conservancy.

Annual Surveys. The On-site Observational Survey, Herd Manager Perception Survey and a Veterinarian and a Biologist Perception Surveys, developed as part of this project, were administered yearly.

Safety feature: Tire protects water source

New handling equipment: Pneumatic squeeze chute

Research Results, Outcomes, and Impact Aim 2

Bison Worker Safety Tailgate Training Guide. In response to safety concerns and training needs expressed in the herd manager surveys the Bison Worker Safety Tailgate Training Guide was created. The guide provides managers with a training resource with 15-minute training on topics including personal protective equipment, low-stress bison handling, safe use of animal medication, safe ATV use, lightning and tornados, thermal stress, and others. The guide was sent to all ITBC tribal herds, shared on social media, in newsletters and on the CS-CASH website.

ITBC Conference Safety Training Courses. The ITBC introduced a safety training track to their annual conference. CS-CASH researchers Dr. Kelling, Dr. Rautiainen and Kelsey Irvine, MPH, were invited to present safety initiatives and to collect survey data. These training courses are held in Las Vegas and host over 100 tribal herd managers, workers and elders each year.

2020 Roundtable Conference Special Issue in Stockman's Journal. Following the 2020 Roundtable, Whit Hibbard, Keynote Speaker and Editor of the Stockman's Journal, devoted a special issue to the topics discussed at the Roundtable with a focus on low-stress Bison handling. Mr. Hibbard provided hardcopies of the Journal for our 2020 and 2021 Roundtable participants. This special Journal issue allowed information regarding worker and animal safety to be disseminated to a wide audience of herd workers.

Personal Protective Equipment (PPE) Kits. Each research herd was supplied with a kit containing PPE that was needed during bison handling, including N-95 respirators, rubberized cloth gloves, ear plugs, safety glasses and first aid supplies. This ensured that lack of PPE was not a factor during roundups and while medicating.

Research Results, Outcomes, and Impact Aim 3

Annual Bison Worker Safety Roundtables were hosted by the research team in 2019, 2020, 2021 and 2022.

- 1st Annual Bison Worker Safety Roundtable Report: https://www.unmc.edu/publichealth/cscash/_documents/_resources/resources-bison-roundtable-2019.pdf
- 2nd Annual Bison Worker Safety Roundtable Report: https://www.unmc.edu/publichealth/cscash/_documents/_resources/resources-bison-roundtable-2020.pdf
- 3rd Annual Bison Worker Safety Roundtable Report: https://www.unmc.edu/publichealth/cscash/_documents/_resources/resources-bison-roundtable-2021.pdf
- 4th Annual Bison Worker Safety Roundtable – June 6-7, 2022. The 4th Annual Roundtable was held in Pierre, SD, as this is a convenient site for many of the tribe members to travel for a processing tour. The 2-day conference was held in person and live-streamed to 51 participants. Responding to suggestions and requests from the 2021 roundtable, the agenda included presentations on field necropsy, parasitology, safe processing practices, buffalo hunts, pesticide exposures, health surveillance, sampling and biosecurity, and safe hauling. On day two participants toured the Crow Creek Department of Wildlife and Natural Resources for presentations on handling and processing safety.
    - 4th Annual Bison Worker Safety Roundtable Report: https://www.unmc.edu/publichealth/cscash/_documents/_resources/resources-bison-roundtable-2022.pdf
- The 5th Annual Roundtable will be held in the summer of 2023 at a location that will accommodate hands-on training.

Presentation to the NIOSH American Indian Worker Safety Conference. Dr. Rautiainen was an invited speaker to the NIOSH American Indian Worker Safety Conference. He presented the project findings to Tribal and non-Tribal researchers, creating a network of research collaborators.

Evaluation and Reporting. We will complete an evaluation of the research, and outreach materials translated through the research in Fall of 2022, after all data has been collected and analyzed. The On-site Observational Survey, Herd Manager Perception Survey and a Veterinarian and a Biologist Perception Survey data will be analyzed and reported back to herd managers, workers, the ITBC and stakeholders. Results from this study will be developed into several manuscripts.

Our team will be continuing this impactful research through 2027 in collaboration with the InterTribal Buffalo Council as part of a newly funded NIOSH AFF project entitled Establishing a Community-Based Training Network to Enhance Bison Herd Workers Safety on Tribal Lands.

Surveillance of Agricultural Injuries

Dr. Risto Rautiainen

Project Aims

1. Conduct annual agricultural health and safety surveys in the Central States region (IA, MN, MO, KS, NE, ND, SD).
2. Explore alternative surveillance methods for injuries and illnesses.
3. Analyze administrative databases and tracking cases reported in the media.

The CS-CASH Surveillance program aims to gain a comprehensive understanding of the burden of occupational injury and illness; working population characteristics; injury and illness frequencies and rates; related exposures, risk factors and costs; and preventive strategies that could reduce the burden of injury and illness in the Center's region, and nationally.

Farm and Ranch Health and Safety Surveys

The Farm and Ranch Health and Safety Surveys (FRHSS) surveys started as a pilot project focusing on agricultural injuries in Iowa and Missouri in 2008; initiated as a collaboration of the University of Iowa and National Agricultural Statistics Service (NASS) and completed at the University of Nebraska Medical Center in 2009. The model was expanded to include a seven-state region in the Central States Center for Agricultural Safety and Health (CS-CASH) initial funding period (2011-2016). The FRHSS surveys were further developed in the second funding period (2016-2022) to include five common work-related chronic conditions (respiratory, hearing, skin, musculoskeletal, and mental health), as well as related exposures and preventive practices. During the two cycles, a total of 5,476 farm and ranch operations (7,195 individual operators) have responded to surveys which were first conducted annually and later semi-annually.

Selected accomplishments and findings from the CS-CASH FRHSS surveys:

- Drs. Beseler and Rautiainen studied the potential biases due to non-response in 2018 surveys. Principal operator and farm production characteristics were analyzed using pre-existing data obtained from Farm Market iD. Despite a low response rate (~18%), there was little evidence of nonresponse bias. A selection bias could still exist, if those who have had injuries or health concerns are more interested in responding.
- Dr. Rohan Jadhav conducted a systematic review of risk factors for agricultural injury. He identified more than 25 significant risk factors. Jadhav also investigated injury frequencies and risk factors from the 2011-2013 data collected by the NASS.. The injury rate during the three years was 7 injuries per 100 farm and ranch operators. Several risk factors were identified, including male gender, age 45-55 years of age, full time operation and larger operation size.
- MPH candidate Anthony Johnson expanded on Jadhav's research to include the first 5 years of data collected by NASS. A total of 34,777 surveys were sent and 11,226 received. The annual injury rate ranged from 6.1 to 8.3 injuries per 100 operators, showing a decreasing trend during the 5-year period. Several risk factors were identified in this study.

- PhD candidate Yi Du conducted a study of risk factors for musculoskeletal pain and discomfort from the 2018 surveillance data. He found that 59% of the 4,354 respondents had musculoskeletal symptoms affecting one or more body sites. Stress was a major risk factor for MSD symptoms; adjusted odds ratios ranging from 4.8 to 5.6 for different types of symptoms. Forceful exertions, repetitive tasks, awkward positions, frequent manual labor, and vibration were among other risk factors.
- Two recent studies by Post Doctoral Fellow Sabrine Chengane et al., and MPH candidate Julia Bai et al., used FRHSS surveillance data for 2018 and 2020 to investigate the association between stress and injuries. The first study found that three work strain indicators: stress, sleep deprivation and exhaustion/fatigue, had a high prevalence (ranging from 18.4% to 29.3%). Musculoskeletal pain was the most important predictor for work strain symptoms. In the second study, 1,766 out of 6,744 operators (26%) reported work-related stress. Previous injury, musculoskeletal symptoms, hearing loss, and chemical exposures were identified as risk factors. Stress was reported by 24% of operators with no injuries, 36% with one injury, and 66% with two or more injuries.
- PhD candidate Alexandra Farfalla investigated exposure to noise and solvents as risk factors for hearing loss. She found that out of 7,491 respondents, 53% reported at least mild hearing loss. Controlling for age, gender, and farm characteristics, the odds of having moderate/severe hearing loss were elevated among those exposed to solvents chemicals alone (OR 1.49), noise alone (OR 4.42) and solvents and noise together (OR 6.03).
- PhD candidate Jagadeesh Puvvula investigated respiratory conditions from the surveillance data. He found the prevalence of respiratory conditions was 18.0% for any respiratory condition, 8.5% for environmental allergies, 5.4% for rhinitis, 4.9% for sinusitis, 4.4% for asthma, and 2.2% for hypersensitivity pneumonitis. Exposures to grain/hay/feed (OR 2.41), animal confinement dust (OR 1.57), field/road dust (OR 2.11), manure/silage gases (OR 1.66), anhydrous ammonia (OR 1.51), and fuels/solvents (OR 1.92) increased the risk of respiratory conditions.
- PhD candidate Suraj Adhikari studied the costs and lost time from injuries using our surveillance data and existing data from government and insurance sources. This study found that the annual rates of injuries to self-employed farmers and ranchers were 15 injuries per 100 operators, or 12 'recordable' injuries per 100 full time equivalent (FTE) workers; 2.3 times higher than the rate published by BLS for hired agricultural workers. Further, this study produced the first national estimate of agricultural injury costs in the US since Leigh et al., (2001) estimate, which was based on 1992 data. When adjusted for inflation, our annual agricultural injury cost estimate in October 2021 dollars was $10.2 Billion; about 13% higher than the inflation adjusted estimate of Leigh et al.; $9.0 Billion.
- PhD candidate Balkissa Quattara studied injury frequencies and risk factors by body part injured. She found several work tasks that are associated with injuries to specific body parts.
- PhD candidate Qianqian Li studied the association of injury and chronic health conditions. She found that 94.6% of those with injury cases also reported one or more chronic health conditions. Adjusted Odds Ratios for injury ranged from 1.41 (environmental allergies) to 4.61 (musculoskeletal symptoms).

Review of National Non-Fatal Agricultural Injury Surveillance System

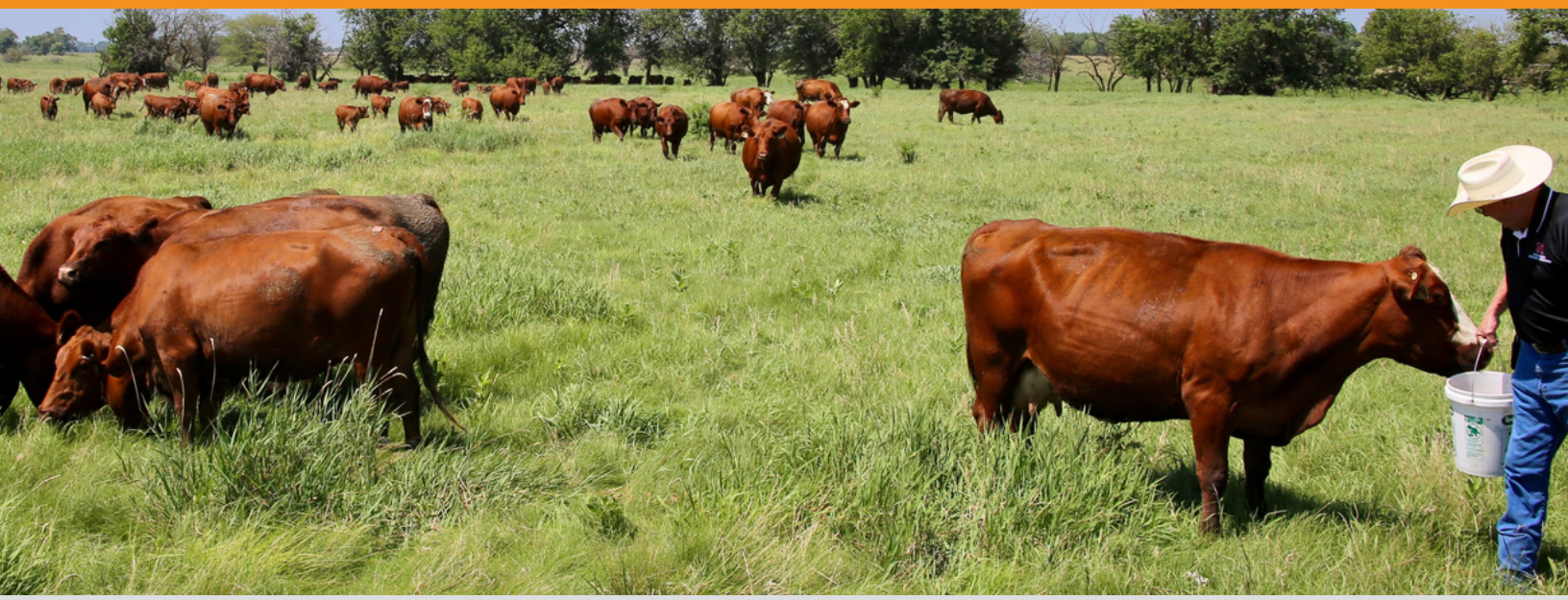
As part of her dissertation research, Dr. Ketki Patel conducted a systematic review of existing national surveillance programs that included non-fatal injuries in agriculture. The review identified and characterized six existing surveillance programs, including their strengths and limitations. Recently discontinued NIOSH surveillance programs were excluded from the review. This review provided a good understanding of the capabilities of current national surveillance programs. A major gap in surveillance is that self-employed farmers and ranchers and workers on small farms are excluded from BLS SOII non-fatal injury surveillance, which is based on OSHA recordkeeping on farms with 11 or more employees. Regional surveillance has an important role, filling the gaps and contributing to a more comprehensive understanding of injuries, illnesses, exposures, risk factors and related costs in agriculture.

Dissemination of Injury Information

CS-CASH has utilized injury information in training and outreach in many ways, including tractor safety training for youth, and 'Telling the Story Project'. Both involve contacts with the media. Telling the story is a collaboration of CS-CASH and neighboring centers in Iowa, Minnesota and Wisconsin. This project involves developing multimedia stories about injury cases where team members meet with the injured person, obtain audio, video, and photography material, and creating articles, videos and multimedia materials for traditional and social media.

Media Monitoring: Injuries Reported in the Media

Since 2011 CS-CASH Surveillance has included a media monitoring program for serious injuries. Electronic and print media sources are scanned with search terms to identify agricultural injury cases. PhD candidate Moses New-Aaron studied the fatal and non-fatal injuries and found that local media report more cases that happen on the farm while major media outlets focus more on roadway injuries and fatal injury cases. The number of fatalities from media monitoring was nearly identical to the official BLS CFOI numbers for the same region.



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Evaluation

Dr. Cheryl Beseler

Project Aims

1. Assess the effectiveness of CS-CASH leadership and governance.
2. Conduct quality assurance by tracking CS-CASH Logic Model activities, outputs, and intermediate outcomes.
3. Evaluate CS-CASH Logic Model end outcomes for social and economic impacts.

Progress

To achieve our aims, we collaborated with content experts in health economics, social networking, organizational communications, statistical analysis, database management, and coalition building. We grounded our evaluation in theories and best practices for:

1. Community engagement
2. Coalition evaluation models published by the Center's Evaluation Director
3. Social networking and communication
4. Social return on investment

As a result, we developed innovative new instruments (i.e., The Healthy Farmer Survey 2020; Social Networking Survey for an Agricultural Center 2017, 2018, 2019) and a new methodology for quantitatively evaluating the achievement of Center goals (i.e., Project Scoring Matrix for Social Return on Investment).

Aim 1. The Evaluation Team places a high value on communication feedback that would promote effective leadership. Every year, we gathered data on Center governance using the Internal Coalition Effectiveness (ICE©) instrument. This survey was administered to Center members, leaders, and EAB members (N = 36) via email with a REDCap link. Response rates ranged from 66% to 90%. Findings showed the Center's leadership and governance structures were consistently rated "*very effective*" (i.e., FY 6 = 6.41, FY7 = 6.5, FY8 = 6.58, FY9 = 6.51), where 1 = "not at all effective" and 7 = "highly effective". The ICE© survey also contained several open-ended questions about Center leadership and governance. Respondents' comments were predominately positive each year. Consistent themes for Center governance and leadership strengths included:

1. Strong and supportive administrative personnel and structures
2. Valued and accessible research and community outreach resources in agricultural health and safety
3. Promotion of collaborative member relationships
4. An active community outreach program

Respondents also provided important recommendations for improvement, and which were acted upon. The Evaluation Team published our methodology for governance evaluation in Workplace Health and Safety.

The Evaluation Coordinator conducted field interviews every year with new pilot investigators for 1) orientation to the Center and its resources, and 2) identification of individual needs and concerns. The structured interviews were recorded, transcribed, and analyzed. We shared findings with Center leaders, and we developed a responsive action plan. The Evaluation Coordinator followed up with pilot investigators one to two months after implementation of the action plan to ensure their individual needs had been satisfactorily met. This work proved crucial to the success of our new pilot investigators, as evidenced by timely milestone completion and *PSM_SROI* instrument scores for improved dissemination activities.

Based on these combined evaluation methodologies, the Center maintained an effective governance and leadership structure that was highly responsive and supportive to members.

Aim 2. The Center's online database was an important tool for monitoring the quality of our internal processes and activities. The database was the result of a collaboration between our Center evaluation team, leaders, and UNMC computer programmers. It contained individualized elements for our Center, and in FY8 we added additional metrics consistent with the NIOSH emphasis on contribution analysis. Every month, the Evaluation Coordinator gathered process data from the database and reported at member meetings to keep members informed of activities tracking status and provide a forum for feedback on Center goals and milestones. The Evaluation Team also met quarterly with Center leaders to assure that our evaluation standards were appropriately working, flexible, and responsive.

The Center placed a high value on stakeholder networking to promote transfer of information and activities into Intermediate Outcomes. To achieve this, we conducted three social network analyses (SNA) studies to better understand our connections with external stakeholders in terms of quality and quantity of connections, role diversity, and information exchange. Our SNA findings revealed important networking strengths. For example, our Center leaders showed high density and centrality, indicating they had close connections with many external stakeholders—local, regional, national and international. We also found that our stakeholders looked to Center leaders for information and expertise in agricultural safety and health. We also identified important areas for improved networking.

Aim 3. An important aim of research is to translate knowledge into practice. This process requires evaluative research that explores target audience readiness to receive information and any barriers they encounter in adopting new practices. To this end, in 2013 the Evaluation Team began monitoring our End User (i.e., agricultural workers) barriers to safety and health measures in terms of their knowledge, attitudes and practices for reducing risks and improving health.

The Evaluation Team repeated the study using the innovative instrument we developed, T*he Healthy Farmer Survey*. Based on a power analysis, we worked with Farm Market ID to select a random and stratified sample of N = 1,000 farmers living in the seven-state region served by our Center. The 19-item survey, which covered knowledge, attitudes, and practices for respiratory and hearing health. Response rate was 509 (50.9%). The survey findings were useful in directing community outreach activities and education to address knowledge deficits. A manuscript is under development.

Other Evaluation Activities

Dr. Beseler, who became the CS-CASH evaluator in September 2021, collaborated on several NIOSH-related projects in collaboration with other NIOSH-funded agricultural centers. In 2021, an evaluation of the NIOSH Agricultural Centers' YouTube Channel was undertaken to assess its growth since its inception in 2013. Members of CS-CASH, GPCAH and UMASH worked collaboratively on the evaluation, which resulted in a manuscript. Extensive time series analysis of total number of views, total watch time, average duration of watch time, and number of subscribers was conducted to analyze the growth in the channel. We also examined seasonality of views and types of videos being watched. The CS-CASH evaluator and the center coordinator, Ellen Duysen, also collaborated with NIOSH and the GPCAH and UMASH to develop a logic model and evidence table for its shared projects involving livestock handling.

To address concerns about research support to pilot project applicants and grantees, Dr. Beseler contacted all applicants who had submitted of letter of intent to apply for funding from the CS-CASH pilot project program in 2021. Most of the applicants responded to ask for assistance in study design, statistical analysis, evaluation, and dissemination. The proactive approach has developed into greater support for grantees and the Center evaluator continues to build these collaborations to assist pilot grantees to ensure their success. Greater personal contact and accessibility has led to stronger partnerships between the Center and its researchers.

FY11 Publications

Beseler CL, Crawford KJ, Charlier DE, Ramos AK. (2021). The NIOSH agricultural centers' YouTube channel: Time series modeling of viewership of agricultural health and safety videos. Journal of Agromedicine. 27(4):368-377. doi: 10.1080/1059924X.2021.2000907.

Beseler CL, Rautiainen RH. (2021). Assessing nonresponse bias in farm injury surveillance data. Journal of Agricultural Safety & Health. 27(4):215-227. doi: 10.13031/jash.14554

Chengane S, Beseler CL, Duysen EG, Rautiainen RH. (2021). Occupational stress among farm and ranch operators in the midwestern United States. BMC Public Health. 21:2076. doi: 10.1186/s12889-021-12053-4

Farfalla AA, Beseler C, Achutan C, Rautiainen R. 2022. Coexposure to solvents and noise as a risk factor for hearing loss in agricultural workers. Journal of Occupational and Environmental Medicine. 64(9):754-760. doi: 10.1097/JOM.0000000000002571

Ouattara BS, Beseler CL, Rautiainen RH. 2022. Agricultural injuries: Risk factors and severity by affected body part among US (Midwest) farmers. Journal of Agromedicine. June 15. doi: 10.1080/1059924X.2022.2089421

Pilot Project Program

Dr. Eleanor Rogan

The Pilot and Feasibility Program has been an essential component of the Central States Center for Agricultural Safety and Health (CS-CASH) since the Center was established in 2011. This program supports projects with funding up to $20,000 over 18 months. The program goal is to enable investigators to collect preliminary data to support the submission of grant applications for independent, longer-term, larger projects related to agricultural safety and health. The central hypothesis of this program is that pilot and feasibility projects funded from this Center will result in subsequent grant submissions to NIOSH (National Institute for Occupational Safety and Health) or other funding agencies to advance agricultural health and safety research. The projects selected for support by this program must address a critical issue in agricultural safety and health and lead to future extensive studies of the selected critical issue. In addition to NIOSH AFF (Agriculture, Forestry and Fishing) funding ($660,000), generous funding from the University of Nebraska Medical Center's Vice Chancellor for Research ($500,000), the University of Nebraska Lincoln (UNL) College of Agricultural Engineering ($20,000), and the UNL Institute of Agriculture and Natural Resources ($20,000) has allowed CS-CASH to fund 65 pilot projects over 11 years. Additional funding received by Pilot Program investigators due to data generated through their pilot research amounts to $19,390,183.

CS-CASH Pilot and Feasibility Project Report

Grant Year	# of Pilot Projects	Peer Reviewed Articles	Presentations Oral / Poster	**Non-Peer Reviewed Articles	***Other Products	Initial Funding	****Additional Funding
Y1	5	0	20	2	8	$95,000	$1,319,581
Y2	7	1	25	15	3	$100,000	$1,275,712
Y3	5	1	3	4	1	$60,780	$15,000
Y4	4	9	25	15	7	$100,000	$3,135,208
Y5	5	4	5	7	5	$100,000	$1,270,000
Y6	7	6	12	2	8	$140,000	$1,853,484
Y7	7	5	4	7	2	$140,000	$120,000
Y8	5	7	13	3	22	$100,000	0
Y9	7	6	8	0	24	$138,742	$3,149,499
Y10	8	5	9	12	6	$140,000	$7,251,699
Y11	5	NA	NA	NA	NA	$100,000	NA
TOTAL	**65**	**44**	**124**	**67**	**86**	**$1,214,522**	**$19,390,183**

*Education / Training includes course/curriculum, material distribution, mtg./conference, training/demonstration, workshop

**Non-Peer Reviewed Articles include reports, booklet/brochure, factsheet, interview (media/other), newsletter, multimedia, websites

***Other Products include reports, focus group, evaluation instrument/tool, questionnaire/survey/checklist, site visit, farm safety audit, consultations, testing and screenings

****Additional Funding includes all grant years including indirect costs

Return on Investment

A return on investment of 1,597% is calculated from subsequent agricultural safety and health funding received by Pilot/Feasibility Program recipients.

Evaluation of Pilot and Feasibility Projects

In addition to evaluation plans built into individual project proposals, the CS-CASH evaluation team also assesses each project's progress, outcomes, and outputs. Evaluations are shared with the grantees and Dr. Eleanor Rogan, Pilot Program investigator.

Resource Sharing

CS-CASH provides a range of no-cost resources to investigators from the inception of their project to completion. Resources include expert analytical assistance from Dr. Cheryl Beseler and the UNMC (University of Nebraska Medical Center) Center for Collaboration on Research Design and Analysis (CCORDA) and content expertise provided by CS-CASH researchers and administration. Grant recipients are invited to attend and present at the monthly CS-CASH member meetings and are forwarded all information about grant opportunities, webinars, conferences, and other information that could assist the investigators with their research.

Pre-Submission Assistance

- Evaluation plan
- Data analysis plan
- Design of survey instruments
- Project review by content experts

Project Period Assistance

- 7-States farmer and rancher database available to project team
- Networking during monthly CS-CASH Member Meeting
- Referrals to stakeholders
- Notifications regarding additional funding opportunities

Post-project Assistance

- Manuscript assistance
  - Technical and financial
    - Data analysis
    - Evaluation
- Notifications regarding additional funding and collaborative opportunities

Funded Regions

Since 2011 CS-CASH has funded 65 Pilot Projects in all 7 of the States served by the Center and several National projects. Recipients include community organizations, health departments, post-doctoral students, scientific researchers, and ag safety and health organizations.

Impact

Pilot Project data have been used to generate more significant awards totaling $19,390,183, including $12,374,682 in the 2015-2021 funding cycle.

Notable Awards:

- AgHealth Nebraska - Nebraska Research Initiative Grant - $100,000
- Prevention and Treatment of Agricultural Respiratory Disorders: A Pilot Educational Program of Rural Health Care NPs and PAs - HRSA (Health Resources and Services Administration) Grant - $769,000
- Development of a mobile application for agricultural safety, AgHealth - HRSA Planning Grant - $85,000
- Role of pattern recognition receptors in organic dust induced airways disease - NIEHS (National Institute of Environmental Health Sciences) R01 (ES019325) $1,650,000
- Identifying the sources of stress and prevalence of anxiety and depression symptoms among young farmers and ranchers in the upper and western Midwest. Josie Rudolphi was awarded $7,200,000 from the U.S. Department of Agriculture (2020-70028-32728) on a project titled North Central Farm and Ranch Assistance Center: Engaging programs to support producer well-being.
- Agricultural and Occupational Exposures in U.S. Veterans with Rheumatoid Arthritis and Associations with Disease Severity. Jill Poole and Bryant England awarded $3,000,000 by the U.S. Department of Defense to study airborne hazards.

Newly Funded Projects in 2021

- Exposure to Zoonotic Diseases in Agricultural Workers of the Great Plains: An evaluation of real and perceived risk and mitigation behaviors in rural agricultural workers of the Great Plains. Mystera Samuelson, PhD
- The Classroom Component: A hands-on experience of agricultural safety and health education aimed at rural youth. Jana Davidson, The Progressive Agriculture Foundation
- The Ability of Adult Female Operators to Reach Agricultural All-Terrain Vehicles Controls. Farzaneh Khorsandi, PhD
- Evidence-Based Training for Employees Exposed to Hazards Associated with the Storage, Handling, Transport, and Processing of Agricultural Wastes. Mahmoud Nour, PhD
- Development of CRC Screening Education Material for Agricultural Workers. Shinobu Watanabe-Galloway, PhD

Publications

Peer-reviewed published manuscripts from CS-CASH Pilot Funded Projects in FY11.

1. Ebel AV, Lutt G, Poole JA, Thiele GM, Baker JF, Cannon GW, Gaffo A, Kerr GS, Reimold A, Schwab P, Singh N, Richards JS, Ascherman DP, Mikuls TR, England BR. (2021). Association of Agricultural, Occupational, and Military Inhalants with Autoantibodies and Disease Features in US veterans with rheumatoid arthritis. Arthritis Rheumatology. 73(3):392-400. Doi: 10.1002/art.41559

2. Gaurav R, Mikuls TR, Thiele GM, Nelson AJ, Niu M, Guda C, Eudy JD, Barry AE, Wyatt TA, Romberger DJ, Duryee MJ, England BR, Poole JA. (2021). High-throughput analysis of lung immune cells in a combined murine model of agricultural dust-triggered airway inflammation with rheumatoid arthritis. PloS One. 16(2):e0240707. doi: 10.1371/journal.pone.0240707.

3. Gaurav R, Poole, JA. (2021). Harness the antiinflammatory power of MyD88 to reduce allergic fungal inflammation? American Journal of Respiratory and Cell Molecular Biology. 64(1):1-3. doi: 10.1165/rcmb.2020-0442ED.

4. Gorucu S, Fetzer L. (2021). Agricultural safety and health learning methods for agricultural workforces. Journal of Agricultural Safety and Health. 27(2):77-85. doi: 10.13031/jash.14355

5. Nour MM, Cheng Y-H, Ni J-Q, Sheldon E, Field WE. (2021). Summary of injuries and fatalities involving livestock manure storage, handling, and transport operations in seven central states: 1976-2019. Journal of Agricultural Safety and Health. 27(2):105-122. doi.org/10.13031/jash.14343

6. Nour MM, Field WE, Ni JQ, Cheng YH. (2021). Farm-related injuries and fatalities involving children, youth, and young workers during manure storage, handling, and transport..Journal of Agromedicine. 26(3):323-333. doi: 10.1080/1059924X.2020.1795034. PMID: 32716249

7. Nour MM, Field WE, Ni JQ, Cheng C.J. (2019). Development of methodology to document and code farm-related injuries and fatalities involving manure storage, handling, and transport - with summary of 2017 incidents. Journal of Agromedicine. 24(1):90-100. doi: 10.1080/1059924X.2018.1539420. PMID: 30409078

8. Sedlacek D, Beacom M, Bista S, Rautiainen R, Siu K-C. (2021). Comparing objective and subjective measures of sleep loss with balance performance in farmers. Journal of Agricultural Safety and Health. 27(2):69-76. doi.org/10.13031/jash.14217

9. Watanabe-Galloway S, Chasek C, Yoder AM, Bell JE. (2021). Substance use disorders in farming population: Scoping review. Journal of Rural Health. May 6. doi: 10.1111/jrh.12575

10. Weichelt B, Scott E, Burke R, Shutske J, Gorucu S, Sanderson W, Madsen M, Redmond E, Murphy DJ, Rautiainen R. (2021) JA:2021-40. What about the Rest of Them? Fatal Injuries Not Captured by the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI). Journal of Agromedicine, July 29:1-6. doi: 10.1080/1059924X.2021.1956663.

Find the full list of CS-CASH Pilot Funded Projects on our website:
https://www.unmc.edu/publichealth/cscash/_documents/outreach-research-pilot-program.pdf

Emerging Issues

Dr. Risto Rautiainen

Project Aims

1. Examine trends and identify emerging issues affecting the health and safety of farmers, ranchers, family members and agricultural workers. CS-CASH identifies emerging issues from monthly injury and fatality case reports from the Center's media monitoring service, annual data from the Center's injury surveillance project, reviews of the literature, and case reports from a network of experts in the field.
2. Respond to identified emerging issues without delay by investigating the problems and solutions and communicating preventive information to the affected populations and stakeholders. CS-CASH prepares and delivers coordinated evidence-bases responses to identified emerging issues. The program also funds small grants to outside entities that are in position to respond. Proposals can be submitted at any time. The Center Director and the Pilot Projects Program team evaluate the proposals and issue expedited funding decisions.

Identification of Emerging Issues

To identify emerging issues, the CS-CASH research and outreach teams have experience using media monitoring. With our growing database of injury and fatality cases, we provided instant responses and reports regarding incidents and prevention. Responses were coordinated within the Center and with our close collaborators, including other NIOSH ag centers. The emerging issues team conducted regular reviews of peer-reviewed literature and ag-industry news to ensure rapid response to emerging issues.

Enhanced Media Monitoring. Mr. Murray Madsen has conducted an Enhanced Farm and Agricultural Injury Media Monitoring program for CS-CASH since 2011. This program includes the following elements:

1. Collection and analysis of relevant print, broadcast, and internet media content monthly
2. Creation of a Microsoft Excel record including details and source citations for each incident
3. Monthly updates of new and existing incident records in datasets provided to CS-CASH
4. Summary collations provided quarterly, year-to-date, and annually to CS-CASH;
5. Annual, a comprehensive summary and multi-dimensional index of injuries provided to CS-CASH
6. Special reports and summaries by mutual agreement

While the other proposed surveillance systems produce primarily statistical and scientific content, the media monitoring system produces powerful incident reports that can be used in presentations and reports, illustrating the types of injuries that have happened and should be prevented. We have found that the media monitoring produced nearly identical numbers of agricultural fatalities as the BLS Census of Fatal Occupational Injuries, plus an equal number of non-fatal injury cases.

Data from our media monitoring is shared with the Marshfield WI-based AgInjuryNews.org, headed by Dr. Bryan Weichelt.

Annual Surveillance Project. Since 2011 the CS-CASH Surveillance program has provided information on injuries and work-related health conditions among self-employed farmers and ranchers that are not covered by any other surveillance system. Only hired employees on larger operations are covered in the Bureau of Labor Statistics surveys. Our surveys provide data on out-of-pocket and insurance-covered expenses for medical care and lost work time due to injury. These severity measures are not available in other surveillance systems for agricultural populations.

Recent and Continuing Emerging Issues Programs, Projects, and Funded Grants through 2022

Creation and dissemination of COVID-19 Pandemic Playbooks for feedyards and poultry-grower industries in collaboration with the UNMC Global Center for Health Security (GCHS). In response to the need for guidance for the prevention of COVID-19 in the feedyard and poultry industries, CS-CASH and the GCHS collaborated to create two comprehensive guides for these industries covering topics from re-engineering workspace to personal protective equipment. As time was of the essence, resources were created and disseminated using the CS-CASH extensive industry email and postal mail databases with delivery to 687 poultry growers and 376 feedyards. In 2022 this continues to be used as a guide to prevent infectious disease and maintain biosecurity on feedyards and in poultry confinement.

Creation of Train the Trainer Fit-Testing Workshops and Train the Trainer Fit-Testing Guide. In response to a lack of personnel qualified to conduct fit testing for pesticide applicators (to meet new Worker Protection Standards), for OSHA ag industry respiratory programs, and workers requiring N-95 respirator use during the COVID-19 pandemic, a Train the Trainer Fit-Testing Workshop and Capacity Building Guide30 were developed in partnership with the Ag Safety and Health Alliance. These resources, targeted to Public Health, health care, safety professionals, and Extension educators, provide the hands-on training, information, and resources needed to conduct respiratory fit testing in agricultural communities. Training includes education on integrating fit testing into an organization's business model. The workshop and guide have been evaluated and used in training and courses throughout the Midwest.

Telling the Story Project (TTSP). Since 2016 members from CS-CASH, Great Plains Center for Agricultural Health (GPCAH), the Upper Midwest Agricultural Safety and Health Center (UMASH), and the National Farm Medicine Children's Center have partnered to develop the Telling the Story Project. The project team includes expertise in industrial hygiene, incident investigation, agricultural engineering, media relations, and educational outreach. This translation activity conveyed emerging issues and injury prevention messaging through personal

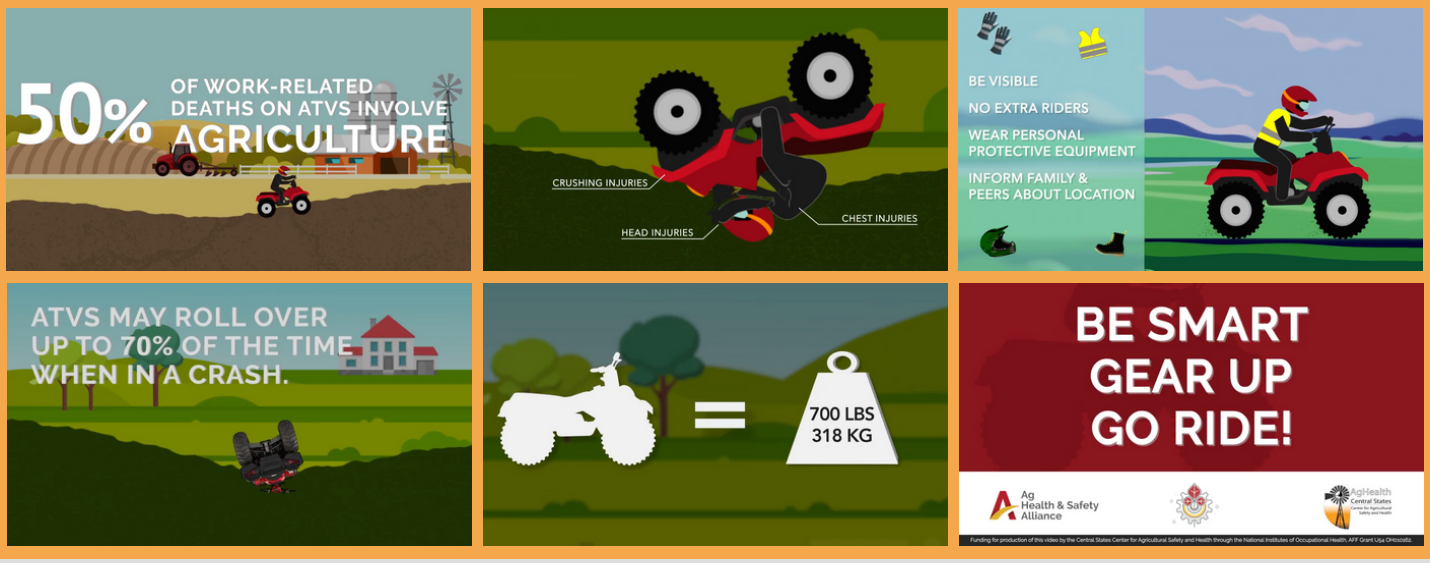
narratives based on first-hand experiences. These stories and relevant prevention messaging and resources, stored on a dedicated website34, have been accessed over 25,700 times as of January 2, 2022. The website houses video and written narratives created by the TTSP team, educational resources, safety vignettes, and discussion guides created by the Telling the Story team. TTSP stories have been featured in SafetyWatch columns and weekly print agricultural media publications that reach over 84,000 households in the Midwest and online at www.agupdate.com. TTSP news articles shared through the Associated Press have reached over 900,000 viewers throughout the U.S.

Response to increases in agricultural ATV fatalities and Injuries. In response to the high number of ATV injuries and fatalities reported in the CS-CASH media monitoring, the following projects were funded through the Emerging Issues Program.

Assessing the prevalence and underlying causes of 2015-2017 ATV/OHV-related injuries on U.S. farms. This study (PI Dr. Bryan Weichelt of the National Farm Medicine Clinic) estimated the prevalence of exposure and injuries among farmers and ranchers, including working and non-working youth, and discussed the results in the context of injury prevention, including strategies of parental role modeling, helmet use, alcohol, crush protection devices, and legislation.

New ATV Safety Design Features: Examining cultural acceptability and piloting an educational intervention among Midwestern youth in agriculture. This project used the Ag Health and Safety Alliance™(AHSA) Gear Up for Ag™ Program to examine current awareness, beliefs, and cultural acceptability of new ATV safety design features among Midwestern youth in agriculture. The AHSA staff worked with an educational advisory panel to formulate questions for a standardized pre-survey. Educators provided training with pilot-tested ATV safety resources to measure possible changes in beliefs or cultural acceptability. AHSA also developed a 2-minute evidence-based "ATV Safety Design" Motion Graphic (https://aghealthandsafety.com/atv-safety/) highlighting the importance of ATV safety, including information on common causes of fatality/injury among young workers and effectiveness of numerous safety design features.

Still shots from the "ATV Safety Design" Motion Graphic



Outreach Program

Dr. Debra Romberger

Project Aims

1. Integrate information from the Center's Research, Evaluation and Pilot Program projects, as well as information from external sources, translating it into a coordinated outreach effort and effectively disseminate the information using a wide range of proven methods.
2. Develop and launch radio social marketing campaigns, innovative training webinars and eHealth web-based toolkits targeted to women in agriculture and to military veteran farmers.
3. Support and advance current information technology efforts that disseminate occupational safety and health information and education to workers, managers, educators, researchers and health and safety professionals in the agricultural industry.
4. Identify, evaluate and disseminate new technology products and applications to workers, managers, educators, researchers and health and safety professionals in the agricultural industry through crowdsourcing and citizen science.

CS-CASH Outreach Programs, Projects, Partnerships and Initiatives

Valuable Partnerships. Outreach efforts of the Center are strengthened and broadened by working in partnership with members of the AgriSafe Network, USDA Extension Service, National Agricultural Safety Database, Ag Health and Safety Alliance, Progressive Ag Foundation, Farm Bureau, Brownfield Broadcasting, Women in Agriculture Organizations, Military Veteran Farmer Organizations, CHS (farmer-owned cooperative), agri-insurance agencies, agricultural news organizations, Grain Handling Safety Coalition (and OSHA Grain Handling Alliance), NE, IA and MO Farm Bureau, Nebraska Public Power District, rural news organizations, and other NIOSH funded Agricultural Centers.

Translation of Center Research. Center projects are developed to contribute to the outreach effort by producing and disseminating new information relevant to their specific fields of study. Research, Evaluation, and Pilot projects served an essential role in testing and evaluating outreach models and communicating evidence-based interventions to specific target audiences. Research projects helped define new knowledge translated in training, videos, electronic and hard-copy resources, coursework, and webinars.

Using Surveillance Databases to Detect Emerging Issues. The Outreach team used the Center's vast surveillance database to detect emerging issues and to provide a rapid response to immediate concerns affecting the agricultural community. The Center provided immediate response to the COVID-19 pandemic in 2020 and throughout 2021, the devastating Midwest flooding in 2019, threats to poultry worker's health during the Avian Influenza outbreak in 2015 and 2022, health threats posed by an aflatoxin outbreak in 2014 and ongoing heat stress concerns in Midwest immigrant workers.

Rural Media. Ag journalist Loretta Sorensen continues to create media-ready, Ag safety and health-related stories for rural newspapers, farm journals, a farm blog, and radio and television stations. Story content is created using experts in the field, with the final copy reviewed by two content experts. UNMC Public Relations and Loretta disseminate the articles through Midwestern media sources and the Associated Press. These articles are available to the media and the public on the CS-CASH website as "Media Releases" (https://www.unmc.edu/publichealth/cscash/newsandevents/index.html). UNMC supports a news-tracking service that provides metrics, including the source running the article/interview, date, frequency, circulation, article size, ad value, and the page number.

Community Contact Network (CCN). The CS-CASH outreach team maintains and grows the Community Contact Network, a database of over 26,000 farmers, ranchers, health care professionals, Extension Educators, Public Health professionals, veterinarians, immigrant support organizations, health and safety professionals, and agribusiness contacts. This database was used to communicate information to stakeholders regarding emerging issues (i.e., flood mitigation protocols, COVID-19 resources, and Avian Influenza worker protection communications), new resources developed by CS-CASH addressing agricultural worker safety, webinars, and new CS-CASH training opportunities (i.e., fit testing train the trainer workshops and OSHA Alliance Stand Up for Grain Safety Week training).

Outreach Focused on Women and Military Veterans. In partnership with the AgriSafe Network, CS-CASH focuses outreach programs and projects addressing the needs of women and military veterans in agriculture. Training webinars, face-to-face training, in addition to broadcast and media messages, were designed to improve health and safety outcomes in these special populations of farmers and ranchers. Linda Emanual, RN AgriSafe Community Health Nurse, presented health and safety information in FarmHer podcasts. AgriSafe has had media interviews on work-related risks in the reproductive health of farm women. AgriSafe maintains a Women In Ag web page that provides safety and health resources, videos, and access to recorded webinars (https://www.agrisafe.org/healthcare/women/).

Developing and Improving New Technologies for Ag Safety and Health. Dr. Aaron Yoder works with a network of safety and health and information technology (IT) experts, including participants from eXtension, NASD, USagCenters, and the YouTube group to develop new and to improve existing technology tools and methods for disseminating information, determining risk and improving safety and health outcomes.

Safety and Health Training Course. The 12th Annual Agricultural Safety and Health 4-day course was delivered as and in-person and live-streamed training and included a live and virtual farm tour. These trainings are held as a Thank You to essential workers and are offered free of charge, providing necessary continuing education credits. Attendees earned up to 36.75 hours of AMA, Nursing, or EMS continuing education credits or 3 hours of academic credit. The response to these trainings has been excellent. In 2022, 97 participants attended with 2,860 hours of CEU credit was awarded.

Social Media and Electronic Outreach. The Center creates content for distribution, including internet-based applications, to reach farm families and workers on the more than 480,000 farms and ranches in our Center's region. Our comprehensive 26,000 member database is made up of farmers and ranchers, public health officials, and safety and health professionals has provided an effective, rapid method to reach farmers and ranchers with information via email regarding emerging issues, as well as with other safety and health information. The CS-CASH website (https://www.unmc.edu/publichealth/cscash/) was accessed 9,780 times in 2021. We can be found across social media platforms at @UNMCCSCASH, including:

- Facebook: https://www.facebook.com/unmccscash
- Twitter: https://twitter.com/unmccscash
- Instagram: https://www.instagram.com/unmccscash/

Our videos are available to view through the U.S. Agriculture Safety and Health Centers on Youtube (https://www.youtube.com/user/USagCenters). Through social media, we have successfully reached agricultural workers, managers, safety and health professionals, and stakeholders.

Follow us!
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via USagCenters

Flickr
@cscash

The CS-CASH Ag Safety and Health Flickr Photo Sharing site (https://www.flickr.com/photos/cscash/) provides agribusiness, the media, and safety professional images to promote safe practices with over 1,400 copyright-free images, with over 13,000 downloads.

Tractor and Equipment Safety Training and Certification. In collaboration with NE Extension, CS-CASH has trained 592 students as part of the National Safe Tractor and Machinery Operation Program (NSTMOP) certification program. This 2-day (16-hour course) provides training and certification on a wide range of topics, from safe tractor operation to the proper use of personal protective equipment.

CS-CASH Outreach Programs, Projects, Partnerships and Initiatives

U.S. Ag Center YouTube Channel. CS-CASH members continue to participate in the leadership of the U.S. Ag Centers YouTube group, including maintaining the website, loading videos, and reporting analytics. This channel has proven to be a successful collaboration between all eleven NIOSH Ag Centers. The YouTube channel (https://www.youtube.com/user/USagCenters) features 167 videos, produced and peer-reviewed by the Ag Centers, including 34 videos produced by CS-CASH. The channel has had over 42,000 watch time hours with 2525 subscribers and 623,200 views since its inception in 2013. Two manuscripts have been published describing this successful collaborative educational resource.

Agricultural Safety and Health Conferences. CS-CASH sponsors agricultural safety and health conferences and members serve on the planning committee of the Midwest Rural Agricultural Safety and Health Conference (MRASH), the International Society for Agricultural Safety and Health (ISASH), the Agricultural Safety and Health Council of America (ASHCA) conference and the Western Ag Safety and Health Conference. CS-CASH members serve on the Board for the ISASH and ASHCA organizations.

Stand Up For Grain Safety Collaborations. In 2021 and 2022 CS-CASH worked in partnership with the OSHA Grain Handling Coalition to present the kick-off event for Stand Up for Grain Safety Week. The Kick-off was held in-person and video-streamed across the world from the Eastern Nebraska Research and Extension Center in Mead Nebraska. Over 1000 workers, managers and safety professionals took part in the four-hour training and education sessions led by CS-CASH staff and partners. The coalition's membership includes OSHA, the Grain Handling Safety Coalition, the National Grain and Feed Association and the Grain Elevator Processing Society.

National FFA Convention. In partnership with CareerSafe Online, CS-CASH participates yearly in the Safety Exhibit at the National FFA Convention in Indianapolis, IN. In October 2021 CS-CASH outreach team provided ATV training on the Center's ATV simulator. The training was conducted on proper personal protective equipment and body positioning to maintain balance. Contact was made with approximately 2,000 students over three days each year.

Boots on the Ground Trainings, Presentations, and Events – The Hallmark of CS-CASH Outreach

The CS-CASH Outreach Team, often accompanied by students, spends a significant amount of time traveling to all seven states in the CS-CASH region conducting ag safety and health training at farm shows, agribusiness events, FFA conferences, Women in Ag Conferences, Veteran Farmer Coalition Conferences, Grain Handling Conferences, as well as small events that we were invited to attend. This outreach is seen as the most impactful, as training can be conducted using educational techniques that are shown to improve learning and move participants toward behavior change. Training topics included

- respiratory protection (techniques to engineer out dust as well as proper selection, use, and care of respirators);
- hearing conservation (techniques to measure and engineer out noise as well as proper selection, use, and care of hearing protection);
- prevention of thermal stress;
- tractor and equipment handling safety (including an annual 12 sites two-day/site
- tractor and equipment safety training certification for young farmers) and training on emerging issues topics as they arise.

From 2016-2021 CS-CASH outreach personnel participated in 89 agricultural farm shows and agribusiness events across the Center's seven-state region. Many of these training sessions are in partnership with other NIOSH Ag Center outreach personnel, saving money on booth space and providing a selection of outreach topics. Training and demonstrations to place at the following locations (except during 2020 and 2021 during the COVID pandemic) Husker Harvest Days (NE), AgConnect (MO), Veteran's Farmer Coalition (changes location yearly), FarmFest (MN), Women in Agriculture Conferences (NE, IA, MO); Sustainable Ag Conference (SD), Lake Region Extension Roundup (ND), Custom Harvesters Convention (KS, NE), and Farm Progress (IA).

Spanish Language Agricultural Safety and Health Resources. CS-CASH continued to translate its educational resources into Spanish. These materials are available to the public at farm shows, training, and the CS-CASH website (https://www.unmc.edu/publichealth/cscash/resources/spanish-resources.html).

Progressive Agriculture Foundation (PAF) Safety Days. CS-CASH outreach personnel participate in PAF Safety Days across the Centers 7-states region. CS-CASH has developed training curriculum on hearing conservation, respiratory health, sun safety, and eye safety. In 2020, CS-CASH collaborated with PAF to produce two videos for the PAF virtual safety days on hearing conservation and Sun Safety. These videos are now used as part of the Virtual Safety Days held across the U.S. during the pandemic.

National Ag Safety Database (NASD). CS-CASH continued to support the maintenance, software updates, and administration of the National Ag Safety Database (https://nasdonline.org/). NASD has continued to grow with training materials, videos, and additional resources.

Emerging Issues

Rapid response to emerging issues specific to agriculture remains a high priority. Webinars related to Winter Farm Floods and SARS COVID-19 pulled in national experts to discuss objectives relevant to living and working in farm and ranch country. In 2021-2022, the Avian Influenza was and continues to be a major threat to producer flocks. A newly dedicated webpage offers a menu of resources for the producer to monitor for the virus as well as appropriate PPE for depopulation, removal, and composting.

Impactful Outreach

National Farm Safety and Health week continues to reach ag health professionals and producers via a robust lineup of topics and speakers. Over 450 individuals registered for the event as well as 81 individuals qualified for badge certification. Meltwater analytics revealed over 96 million folks were reached via news/media and social media.

Outreach to Women and Military Veterans in Agriculture

Collaboration with AgriSafe

Project Aims

1. Increase outreach education for farm women and military veteran farmers working in agriculture regarding occupational health and safety practices.
2. Establish media relationships to bring awareness to issues of women and military veteran farmers to the broader agricultural community.
3. Development of syndicated health and safety information via the AgriSafe website platform to house evidence-based information specific to the needs of women and military veterans.
4. Assess and rapidly address emerging health hazards specific to agriculture populations related to weather events, COVID-19, and Avian Influenza.

Summary

While building on outreach projects and producer reach as outlined in the previous five years of annual reports, AgriSafe Network continued forward momentum during year six to serve the occupational health needs of women and veterans working in agriculture. Fiscal years one through three were heavily focused on assessment of women's health needs and subsequent evidence-based initiatives to meet those needs. Fiscal years three through six were focused on the health and safety of the Veteran farmer. The below bulleted points illustrate our accomplishments.

Women's Health

- Presentation: University of Nebraska Medical Center College of Public Health AgriMed course, - "Optimizing the Health of the Female Producer" (a comprehensive review of the female producer's work and health hazards), - Over 300 clinical and public health professionals trained.

- Additional trainings: Building capacity from the work funded by CS CASH, OSHA's women health project has developed 12 training topics related to the physical hazards in agriculture Women's Health - AgriSafe Network (https://www.agrisafe.org/healthcare/women/#womenwebinars), - Over 800 females trained this past year.
- Women's Health website page: AgriSafe dedicated women's health page connects the learner to fact sheets, webinar, women's ag health risk assessment, related website and articles framing the occupational hazards and appropriate mitigation strategies- Over 950 unique views since development
- Downloadable resources: Free downloadable posters and tutorial video were created to educate producers on doable mitigation strategies to address the musculoskeletal occupational health hazards of the female producer-432 poster downloads and 272 video views.
- Video stories to connect: Stories from the Field "Carey's Story", is a compelling narrative of a female cattle manager's recovery following a MVA.- Over 130 YouTube views.
- Addendum women's health resource: Expanding on the topic of Reproductive Health, AgriSafe recently researched and created a "What You Need to Know: Feed Yard Animal Handling" resource for female feed yard workers. Please see the attached document. This resource will be included in the UNMC COPH Feed Yard 15 project.

Veteran Farmer Health

- Presentations: Veteran farmer groups and organizations, "Great Resources for the Veteran Farmer" (a juxtaposition review of the unique military and agricultural workplace exposures and mitigation strategies. - 20 VFW and auxiliary members and 35 military veterans trained at the national gathering at the Farmer Veteran Coalition conference. AgriSafe also tabled an exhibit of occupational health resources at the aforementioned conference of over 250 individuals. AgriSafe coordinated and collaborated with Veteran Farmer health and safety experts to host a Frontlines panel presentation "Ag Safety and Health Risks and Remedies for Veterans" at the annual Midwest Regional Ag and Safety Conference. - Over 50 trained.
- Veteran Farmer Health website page: Dedicated webpage featuring five topics related to veteran farmer health and safety including a webinar validated for continuing education credits, fact sheets and guides, and other website resources, Veterans - AgriSafe Network (https://www.agrisafe.org/healthcare/veterans/)- Over 80 unique views.
- Video stories to connect: Stories from the Field "Cindy's Story" is an account of the mental and physical exposures and injuries related to active-duty service during war time from the voice of an Army Veteran and female farmer. – Over 80 YouTube views.
- Veteran Farmer social and traditional media outreach: Using keyword, AgriSafe Veteran Farmer, Meltwater software analytics reveal a substantial tracking of Veteran Farmer topics- Over 1,000,000,000 reached.
- Partnership: AgriSafe has established a working relationship with the Farmer's Veteran Coalition and will present at an upcoming regional conference regarding occupational health standards for the beginning farmer.

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