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ANNUAL REPORT

of the

Central States Center for Agricultural Safety and Health

University of Nebraska Medical Center
College of Public Health

NIOSH AFF 1U540H010162

AgHealth Central States
Center for Agricultural Safety and Health

University of Nebraska Medical Center

The Central States Center for Agricultural Safety and Health (CS-CASH), funded by the National Institute for Occupational Safety and Health (NIOSH), leads multidisciplinary research and outreach efforts to prevent injuries and illnesses among farmers, ranchers, and agricultural workers across the region. Through strong collaborations and core programs in research, outreach, and evaluation, CS-CASH develops practical solutions, supports all agricultural populations, and provides strategic leadership to advance health and safety in agriculture.

CS-CASH serves one of the nation's most productive agricultural regions, North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, and Missouri. We partner with NIOSH, fellow Ag Centers, agricultural industry leaders, Extension, and many other committed organizations and individuals to advance our shared mission: improving health and safety and reducing the burden of injury and illness in agriculture.

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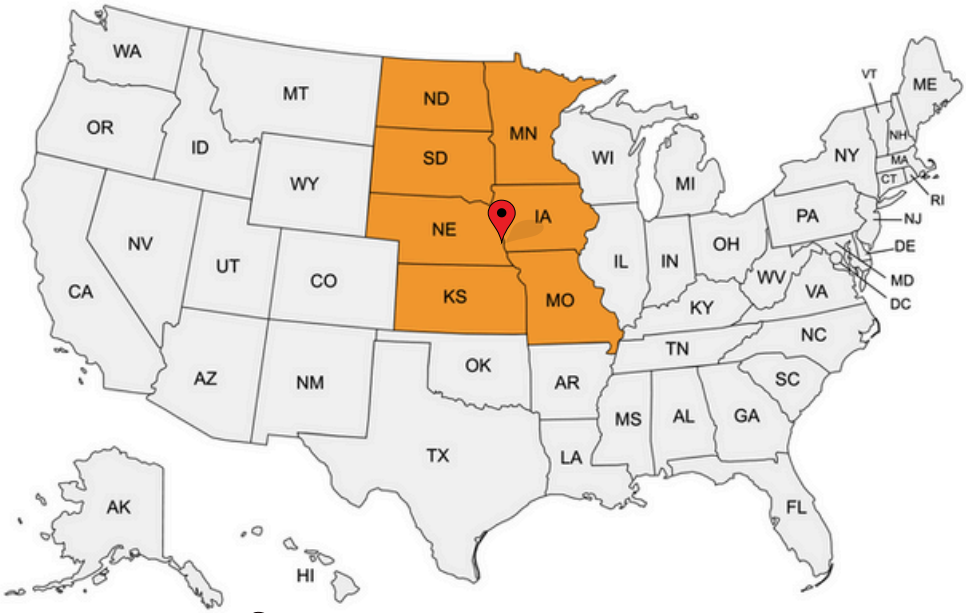

The CS-CASH is located at the University of Nebraska Medical Center in Omaha, Nebraska.

CS-CASH Key Personnel

Risto Rautiainen, MS, PhD	Center Director	rrautiainen@unmc.edu
Todd Wyatt, PhD	Deputy Director	twyatt@unmc.edu
Eric Ernest, MD, EMT-P, FAEMS	Outreach Director	eric.ernest@unmc.edu
Aaron Yoder, PhD	Education Director	aaron.yoder@unmc.edu
Eleanor Rogan, PhD	Pilot Program Director	egrogan@unmc.edu
Cheryl Beseler, PhD	Evaluation Director	chbeseler@unmc.edu
Jenelle Pomicter	Administrator	jpomicter@unmc.edu
Ellen Duysen, MPH, COHC	Center and Outreach Coordinator	ellen.duysen@unmc.edu

External Advisory Board 2024-2025

Marilyn Adams	Founding President, Farm Safety 4 Just Kids
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Mike Keenan	Senior VP Loss Control Services, Gallagher Insurance
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Tawnie Larson	Project Coordinator, Kansas State University AgrAbility
Bonita Lederer	Director of Producer Education, Nebraska Cattlemen
Dr. Brad Rein	USDA - retired
Brad Snyder	Director Brand Reputation, Nationwide Insurance
Derry Stover	Injury Epidemiologist, Nebraska DHHS
Cheryl Tevis	Journalist and Founding Member of Iowa Women in Agriculture

MULTI-YEAR PROJECTS

The NIOSH Agriculture, Forestry, and Fishing Program provides grant funding that supports CS-CASH's multi-year research, prevention, education, and outreach initiatives. These projects seek to identify the causes of injuries and illnesses and to create practical solutions that reduce hazards, exposures, and adverse health outcomes across the Center's seven-state region and beyond. CS-CASH investigators conduct research to better understand and minimize harmful exposures in agricultural work environments; develop and test effective control measures and protective technologies; and deliver education, outreach, and prevention programs that help safeguard farmers, ranchers, their family members, employees, contractors and visitors on farm and ranch operations.

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

Feedyard safety is a major focus of the Central States Center for Agricultural Safety and Health (CS-CASH) with the development of the Feedyard 15 commendation program. In the third year of the project, we continued collecting safety culture information from feedyard managers and workers at both sites that use/don't use the Feedyard 15 materials through site visits, and mail and phone surveys.

Project Highlights:

- Advanced the Feedyard 15 training and commendation program, now used by 53 companies representing 61 feedyards and 4,137+ employees across 16 states.
- Developed and deployed a motivators and barriers survey targeting 1,000 feedyards to assess drivers and obstacles related to regular safety trainings.
- Expanded dissemination efforts of the Feedyard 15 through social media, trade journals, professional meetings, and peer-reviewed publications.
- Conducted rapid multi-sited ethnographic research to gather "thick descriptions" of worker experiences, safety culture, and emerging issues across diverse feedyard operations.
- Continued a structured system of worker incentives (Feedyard 15 branded PPE, hats, vests, multitools, lunch bags) to support training engagement and completion.
- Continued partnerships with major industry stakeholders, including Nebraska Cattlemen, Gallagher Insurance, and Agricultural Safety and Health Council of America (ASHCA).
- Presented about the project at the annual safety conferences and published safety related articles in trade publications.
- Published a peer reviewed article on using wearable technology to monitor heat exposure of cattle feedyard workers.
- Currently converting Feedyard 15 modules to online training micro-credentials, digital badges.

Hot off the Press - Preliminary Data

Motivators for managers to engage in safety training activities

"We received the vests. Thank you very much! Our team is enjoying these modules. We have even had some of the guys ask us when the next safety meeting would be. I have never had that happen before 😊"

Email from Feedyard Safety Manager

CHECK OUT THE FEEDYARD 15 WEBSITE

Visit go.unmc.edu/feedyard-15

Or use your smartphone to scan the QR code.

See manuscripts related to this work at the end of this report

Cattle Feedyard Worker Health Study

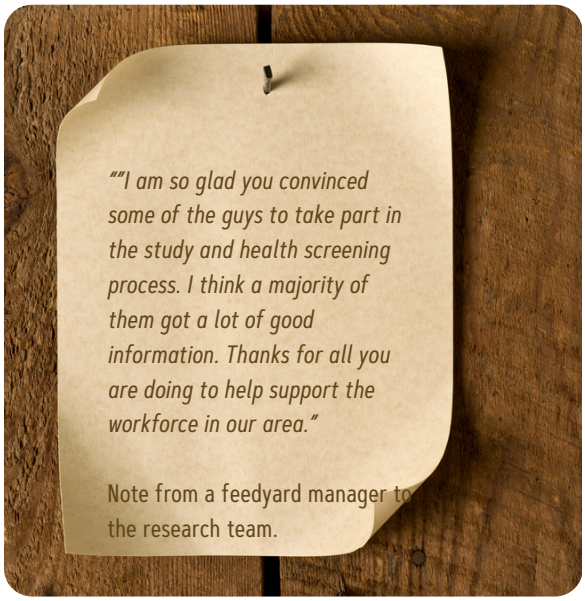
Athena Ramos, PhD, MBA, MS, CPM

The Aims of this Research:

The Cattle Feedyard Worker Health Study is a longitudinal descriptive study exploring how stress is associated with physical health, mental health, and social well-being outcomes across time and industry-specific seasons among cattle feedyard workers. We use multiple methods, including health assessments conducted through onsite health fairs at cattle feedyard operations, one-on-one interviews with workers, and ethnographic field work. Through this study, we hope to understand more about health, stress, and workers' lives.

Project Highlights:

- 550 study participants
- Conducted 178 interviews with feedyard workers
- Facilitated CPR and first aid training for a feedyard partner
- Conducted 28 feedyard health fairs at feedyard partners across Nebraska, Kansas, and Colorado
- Developed and mailed a bilingual (English/Spanish) resource on cold stress prevention
- Project PI presented at the No Coast SciComm 2024 Conference on rural community engagement
- Project PI was interviewed by Rural Radio Network about the Cattle Feedyard Worker Health Study



CHECK OUT THE FEEDYARD WORKER HEALTH STUDY WEBSITE
https://go.unmc.edu/feedyard_workforce
Or use your smartphone to scan the QR code.

CHECK OUT THE COLD STRESS RESOURCE
https://go.unmc.edu/cold_stress
Or use your smartphone to scan the QR code.

CHECK OUT DR. ATHENA RAMOS' RURAL RADIO INTERVIEW
https://go.unmc.edu/rural_radio_interview
Or use your smartphone to scan the QR code.

See manuscripts related to this research at the end of this report

The Exposome and Organic Dust-Induced Lung Injury

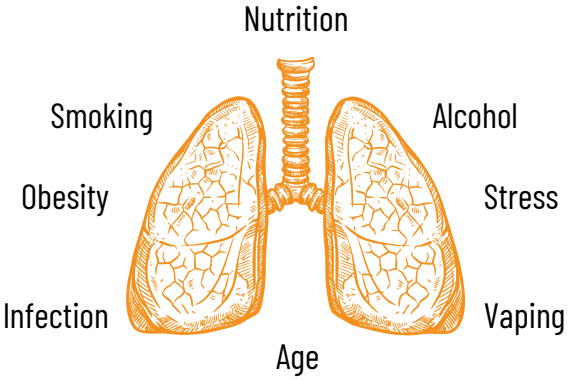
Todd Wyatt, PhD

The Aims of this Research:

- Determine the mechanism of swine barn dust on increased viral infectivity of SARS-CoV-2 using both human and mouse models of lung primary epithelial cells and organoids.
- Determine the mechanism of enhanced dust-mediated lung infection injury with alcohol exposure.
- Determine the role of gut-derived bacterial outer membrane vesicles (OMV) and the mechanism of zinc deficiency in dust-mediated lung injury in response to bacterial infection.

The Agricultural Exposome:

How do environmental exposures impact innate lung defense?



Significant Results:

- Two distinct mechanisms have been discovered for increased susceptibility to SARS-CoV-2 under conditions of organic dust inhalation. (1) Swine barn dust increases the expression of the specific receptor (ACE2) for this virus in the lung of mice. (2) Dust-activated sheddase enzyme (ADAM-17) activity increases and this increase leads to increased viral uptake.
- We found that this enhanced inflammatory pathway is regulated by a key protein kinase, and that a result of this modulation is the potential dysregulation of important innate cytokine responses to infection. This has implications for the duration and severity of COVID-19 in those who are exposed to organic dust environments.
- We explored whether the known effect of dust on cilia slowing is impacted by zinc therapy. Using a more effective cellular-uptake version of zinc (ZinPro), we found that cilia could be protected from dust-induced slowing. We identified the mechanism of this effect to be a direct inhibition of the enzyme that slows cilia, thus protecting the cilia flight response in maintaining mucociliary clearance.
- We developed an alcohol, dust, and zinc-deficient exposome model for both cells and mice. We generated and characterized liver and gut-derived extracellular vesicles for the delivery of alcohol metabolizing cargo that may impact lung injury in response to inhaled occupational dust in alcohol consuming individuals and in nutritionally zinc-deficient workers.
- Utilizing a model of intratracheal instillation of S. pneumoniae in mice, we have successfully demonstrated that swine barn organic dust significantly enhances lung infection and reduces bacterial clearance in the exposomal context of alcohol-feeding of the mice. This enhanced burden is even significantly greater than the effect of alcohol consumption alone. Interestingly, there was no change in bacterial clearance in mice who were instilled with dust, but not alcohol-fed.

We are now implementing a pre-clinical intervention therapy using two approaches: zinc supplementation using a highly absorbed conjugate of zinc (ZinPro) as well as butyrate supplementation (the product of a high fiber diet) in the context of bacterial infection to reverse the lung infection injury.

See manuscripts related to this research at the end of this report

Establishing a Community-Based Training Network to Enhance the Safety of Bison Herd Workers on Tribal Lands

Mystera Samuelson, PhD

This project convenes Tribal bison herd workers each year to share knowledge, training, and best practices for ensuring safety in bison handling. By fostering community-led training and peer support, the project strengthens safety expertise and workforce capacity within Tribal communities engaged in bison management, harvest, and meat processing and distribution.

Project Highlights:

Strengthened Partnerships and Expanded Reach:
Ongoing collaboration with Arlo Iron Cloud Sr. (Diné and Oglala Lakota) and Lisa Mni (Oglala Lakota) has broadened the project's engagement, reaching more than 300 individuals across Native communities during the reporting period.

Understanding of Revitalization and Food Sovereignty:
The project team continues to explore how revitalizing bison culture supports Tribal priorities in cultural preservation, environmental restoration, food sovereignty, and community health and resilience.

Integrated Safety and Health into Tribal Priorities:
Project strategies have evolved to include discussions on topics such as the safe harvest of bison—connecting occupational safety and health directly with broader Tribal goals and values.

Broadened Focus from "Worker Health" to "Community Health":
The project now emphasizes community-wide well-being, addressing the safety of children, pregnant women, elders, herd workers, and others involved in bison harvest, processing, and management activities.

Identified Emerging Health Threats:
The team continues to assess new risks to worker health within Indigenous bison ranching, including tick-borne and other zoonotic diseases, to better inform prevention and response efforts.

Strengthened Relationships through Community Engagement:
Through sustained relationship-building and participation in harvesting, food preparation, and cultural events, the project team has gained deeper insight into local practices and potential safety risks, such as the consumption of raw tissues. These connections allow for more relevant, culturally grounded safety messaging.

Hosted the 8th Annual Tribal Bison Herd Worker Safety and Health Roundtable

The annual roundtable was held in Mayetta, Kansas, held in collaboration with the Prairie Band Potawatomi Nation and the InterTribal Buffalo Council. The 2-day meeting featured a tour of the PBPN bison working facility and pastures. The roundtable continues to serve as a vital forum for sharing safety knowledge, training, and experiences among Tribal bison herd workers.

> ***"I am a very different person than I once was, and it's because of them (the buffalo). Returning to them changed me."***
>
> ***"Caring for the buffalo is caring for ourselves. They are our relatives."***
>
> **Tribal Members**

LEARN MORE ABOUT THIS WORK
Visit go.unmc.edu/bison
Or use your smartphone to scan the QR code.

Our Partners: The **InterTribal Buffalo Council** (ITBC) is a collection of 83 tribes in 22 different states that facilitates the management of over 20,000 buffalo. Its members manage more than 32 million acres of Tribal lands, and have restored buffalo to nearly 1 million of those acres. From the large intact grasslands of Montana, to the small desert herds of New Mexico, ITBC is committed to reestablishing buffalo herds on Tribal lands in a manner that promotes cultural enhancement, spiritual revitalization, ecological restoration, and economic development.

Evaluating the Safety of Agricultural Vehicle Ingress/Egress for Aging Producers

Bethany Lowndes, PhD

The Aims of this Research:

Falls from agricultural vehicles for aging producers may result in serious, potentially career-ending, injuries. This research leverages novel observational techniques and an assessment of strength, balance, and ingress/egress performance to design user-centered interventions for the reduction of producer fall and injury.

Project Highlights:

The research team has designed an installation kit for data collection in tractor cabs to enable field collection. This kit includes a secure mount and installation instructions for standardization. Shown here is the mounting kit for in-cab data collection using a security camera.

Preliminary testing of the observational devices in the field is ongoing.

A computer science student has been recruited to work on this project as a UNMC College of Public Health doctoral student in Environmental, Agricultural and Occupational Health.

New technologies for video capture and machine learning and artificial intelligence integration have been acquired for comparison. These include:

- Reolink Argus 4 Pro with Solar Panel
- Logitech Mevo Start
- Intel Realsense D435i

Advanced technology can improve data capture and processing efficiency for field collection by automating recordings of target events.

Applied Human Factors & Ergonomics 2024 Best Paper Award Winner

Lowndes B, Gutierrez A, Pitla S, Rumuri S, Siu J, Yoder A. (2024). Feasibility of integrating electromyography and computer vision for occupational safety during tractor ingress and egress.

Distribution of Worker Educational Materials and Personal Protective Equipment in Response to Highly Pathogenic Avian Influenza in Dairy and Poultry Facilities

Matthew Nonnenmann, PhD, CIH

During the 2024-2025 outbreak of Highly Pathogenic Avian Influenza (H5N1), the Central States Center for Agricultural Safety and Health (CS-CASH) disseminated Worker Personal Protective Equipment (PPE) Kits for farms to provide resources to workers to protect against disease transmission on farms. A comprehensive outreach and distribution campaign was implemented across a seven-state region, targeting dairy and poultry producers.

Project Highlights:

- A comprehensive database of dairy and poultry producers was compiled, totaling 16,233 farms.
- Producers were divided into two communication groups based on available contact information: 12,175 farms received postcards, and 3517 farms received emails.
- 65 farms requested PPE materials (64 from postcard recipients, 1 from email recipients) resulting in 718 kits being mailed to producers.
- 43 farms were selected for detailed evaluation of PPE usage effectiveness.
- Evaluation responses provided insights into PPE kit utilization, efficacy in reducing H5N1 transmission risks, and barriers to implementation.
- Evaluation analyses included assessment of response rates, identification of logistical and communication barriers, and recommendations for improving future outreach and distribution efforts.
- Created 3 videos that highlight the important biosecurity procedures of how to properly put on, take off, and clean and store PPE. These videos will be translated in Spanish.

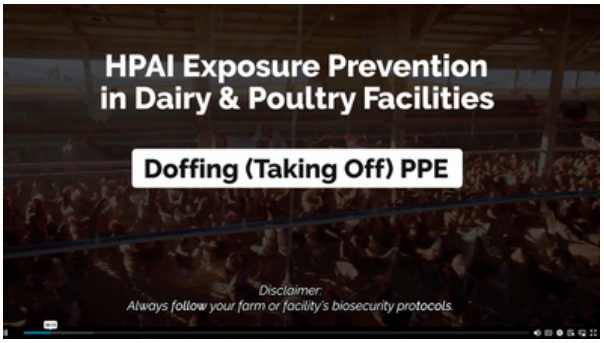
This PPE dissemination strategy illustrates practical considerations for effective public health communication in agricultural settings during infectious disease outbreaks, highlighting the importance of diversified outreach methods, and follow-up evaluations to ensure optimal use of PPE resources and farm preparedness.

Videos Were Developed to Provide Guidance on Donning, Doffing, Cleaning and Storing PPE.

Donning- Putting on your PPE correctly

https://vimeo.com/f8creative/review/1108517726/23a9a464a0

Doffing- Taking off your PPE correctly



https://vimeo.com/f8creative/review/1111735731/99026ea639

Cleaning and Storing Your PPE

https://vimeo.com/f8creative/review/1112320959/d2f00a31b4

Surveillance of Agricultural Injury, Illness, and Stress in the Central States Region

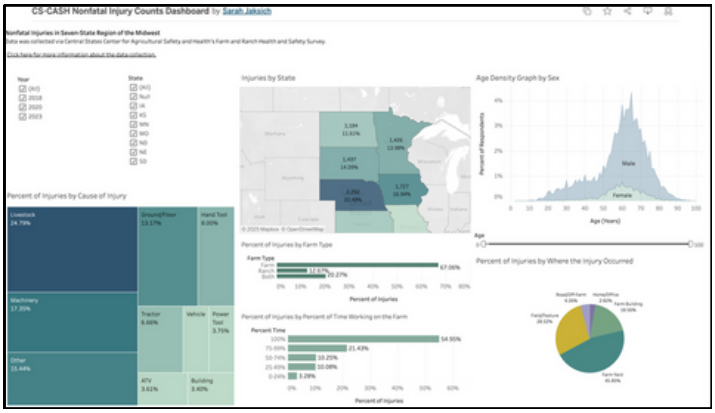
Risto Rautiainen, PhD

Agriculture remains one of the most hazardous industries in the United States. To better understand and reduce injuries, illnesses, and emerging health risks for farmers and ranchers, the Central States Center for Agricultural Safety and Health (CS-CASH) conducts a multi-year regional surveillance program. This initiative gathers data directly from agricultural producers, tracks media-reported injuries and fatalities, and studies the stress and mental health outcomes among young and beginning farmers. Our work focuses on seven states within the CS-CASH region and aims to ensure that the injury and illness experiences of farmers and ranchers, not captured in national surveillance systems, are represented in public health research, prevention strategies, and policy decisions.

Project Highlights:

Farm & Ranch Health and Safety Survey (FRHSS)

- 17,497 farm and ranch operations were invited to participate across seven states.
- 1,942 farmers and ranchers responded, sharing information about recent injuries, work-related health conditions, safety practices, and production activities.
- Combined with prior survey years, our datasets include 10,000+ individual operators.
- The average injury rate from the three rounds of data collection was 17 injuries /100 person-years.
- The prevalences of work-related chronic health conditions were: respiratory disease 20%, hearing loss 56%, skin conditions 17%, musculoskeletal conditions 57%, and stress-related conditions 40%.



A new injury surveillance dashboard was created to highlight injury counts, rates, and characteristics by year and state. The dashboard is available on the center's website.

https://www.unmc.edu/publichealth/cscash/research/surveillance.html

This year, CS-CASH researchers produced five peer-reviewed journal articles and four scientific conference presentations using these data. **Notably, one groundbreaking publication estimated the national cost of agricultural injuries at $11.13 billion in 2024 dollars, highlighting the urgent need for prevention investments.**

Young Farmer Mental Health & Safety Study Recognizing that young and beginning farmers face unique pressures, CS-CASH launched a long-term cohort study to explore how stress, anxiety, and depression may influence injury risk. Young producers were recruited at farm shows, conferences, and agricultural events in eight Midwestern states. Expanded outreach methods—including direct email and mail—are now being used to boost participation.

Monitoring Media-Reported Agricultural Injuries & Fatalities CS-CASH continues to monitor agricultural injury and fatality cases through news reports and public media sources. These data help fill gaps in national reporting systems and support timely awareness and prevention messaging. Monthly and annual case summaries are compiled and shared publicly through AgInjuryNews.org and the CS-CASH website.

Training Our surveillance work directly supports graduate student research and training. These experiences help grow the workforce of professionals dedicated to protecting the health and safety of agricultural communities.

EVALUATION

Evaluation has been integrated into every aspect of CS-CASH activities to support NIOSH's Evaluation Capacity Building Plan. The evaluation of our research, pilot projects, and outreach cores are designed with the goal of providing evidence of impact and measurable outcomes using contribution analysis based on a valid theory of change.

Evaluation

Cheryl Beseler, PhD

The Aims of CS-CASH Evaluation Program:

The CS-CASH evaluator's responsibilities include tracking Center publications and activities, maintaining communication with pilot project grantees and supporting their research efforts, and providing research assistance to core project principal investigators. Dr. Beseler serves as the evaluator for AgriSafe, where she leads evaluation efforts for the QPR and FarmResponse programs aimed at improving mental health among agricultural operators in rural communities. She actively participates in team meetings, Executive Committee meetings, and Center Director meetings to support Center management and present evaluation reports as needed. In addition, Dr. Beseler contributes to outreach initiatives and mentors students completing capstone projects and MPH degrees in agricultural safety and health.

Evaluation Program Highlights:

Submitted two NIH proposals and an application to the Robert Wood Johnson Foundation to obtain funding for AgriSafe's adaptation of "Counseling on Access to Lethal Means (CALM)" for the agricultural community.

Working with Dr. Aaron Yoder, designed a safety survey for cattle feedlot managers to obtain baseline data prior to launching a Safety Climate and Safety Culture inventory to be used on feedlots.

Worked with pilot project grantees to assist them with their projects. This work included:

- Grant development and survey design for an Alpha Gal research project.
- Assisted with the evaluation of a pilot project involving the development of educational materials.
- Power calculations for pilot project proposals.
- Assisted with survey design and sample collection in a pesticide study.

Assisted with conceptual ideas for a manuscript; conducted statistical analysis related to a needs assessment of agricultural programs. Assisted with manuscript preparation and revisions, resulting in publications.

Completed a collaborative grant project with the High Plains Intermountain Center for Safety and Health (HICAHS) involving building partnerships between behavioral health professionals and clergy in rural Nebraska. Dr. Beseler acted as evaluator for the project, establishing two networks outside of the Kearney, NE, region.

Publication of a paper with the Childhood Agricultural Safety Network (CASN) evaluating the organization and its ability to meet the needs of the agricultural safety workforce whose mission is to reduce agricultural injuries in children.

See manuscripts related to the evaluation program at the end of this report

PILOT & FEASIBILITY PROGRAM

The Pilot and Feasibility Program has been a core component of CS-CASH since the Center's establishment in 2011. This program provides up to $20,000 in funding over an 18-month period to support innovative projects in agricultural safety and health. Its primary goal is to enable investigators to gather preliminary data necessary for developing competitive grant applications for independent, larger-scale research projects. The central hypothesis guiding the program is that pilot and feasibility projects funded through CS-CASH will lead to subsequent grant submissions that advance agricultural health and safety research or foster the development of new safety technologies, products, or sustainable resources. Projects selected for funding must address a significant and relevant issue within the field of agricultural safety and health.

Impact

82 Pilot Projects have been funded since 2011

- **Funds awarded since 2011:**
  - NIOSH AFF (Agriculture, Forestry and Fishing) - **$855,000**
  - University of Nebraska Medical Center's Vice Chancellor for Research - **$620,000**
  - University of Nebraska Lincoln (UNL) College of Agricultural Engineering - **$20,000**
  - UNL Institute of Agriculture and Natural Resources - **$40,000**
- Peer Reviewed Manuscripts - **69**
- Oral and Poster Presentations - **182**

A return on investment of 1,550% from subsequent agricultural safety and health funding received by Pilot Program recipients - $22,193,827

Assistance Provided to Grantees

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

Resource Sharing

CS-CASH provides a range of no-cost resources to investigators from the inception of their project to completion.

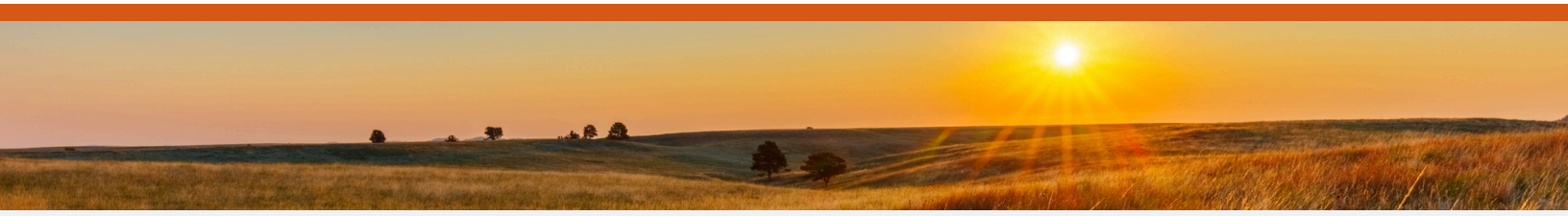
Expert analytical assistance from Dr. Cheryl Beseler and the UNMC (University of Nebraska Medical Center) Center for Collaboration on Research Design and Analysis (CCORDA).

Content expertise provided by CS-CASH researchers and administration.

Assistance with manuscript development.

Networking opportunities as 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.

See manuscripts related to the Pilot Progam at the end of this report



Ongoing Pilot Projects

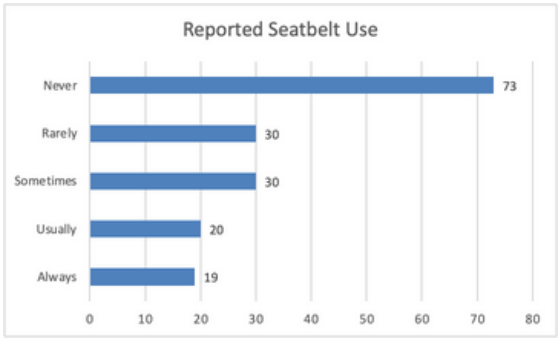
Public roadway safety behaviors of Central States Region farm vehicle operators

PI(s): Josie M. Rudolphi, PhD, Sean Tormoehlen, University of Illinois, Urbana-Champaign

This project is investigating the perceptions and beliefs of agricultural producers about roadway incidents and safe operation of farm vehicles on roadways using the theoretical framework of the Health Belief Model.

A Sneak Peek at the Preliminary Results:

- 413 surveys analyzed to date - 25% response rate.
- 278 respondents indicated YES to driving a farm vehicle on public roadways in the past six months



> *Injuries from roadway crashes involving farm vehicles are a significant concern, and applying behavioral theories helps identify key factors to target in promoting safer behaviors and reducing these risks.*

Surveillance of Ticks and their Pathogens in Bison Populations.

Shaun T. Cross, Ph.D. (PI), Mystera M. Samuelson, Ph.D. (Co-I), University of Nebraska Medical Center

The Central States region is at an emerging risk for several different debilitating tick-borne diseases (TBDs). Of particular concern and risk are Indigenous agricultural workers, such as those that work closely with bison (called buffalo here). Best preventative measures and practices protect both livestock and workers to these pathogens. In this pilot project, we will assess the risks for buffalo and their handlers to TBDs.

Project Highlights:

- Collected blood samples from buffalo at the Konza Prairie Biological Station in Manhattan, KS. Screened these samples for various tick-borne pathogens. Approximately 1/3 tested positive for Borrelia burgdorferi (causative agent of Lyme disease) and 2/3 were seropositive for Anaplasmosis.
- Presented tick information (recognition, prevention) at the Annual Tribal Bison Worker Safety and Health Round Table hosted by CS-CASH and the InterTribal Buffalo Council.
- Presented work at 4 conferences.
- Manuscript submitted to Frontiers in Public Health on the 2024 Annual Round Table Event for programmatic evaluation on tick-borne disease education material.

> *"That's what we are worried about (ticks). It's a real problem down here (Oklahoma)." - Tribal Member*

Ticks collected from bison were screened for tick-borne pathogens. This information is provided to tribal herd managers, allowing them to take prevention measures.

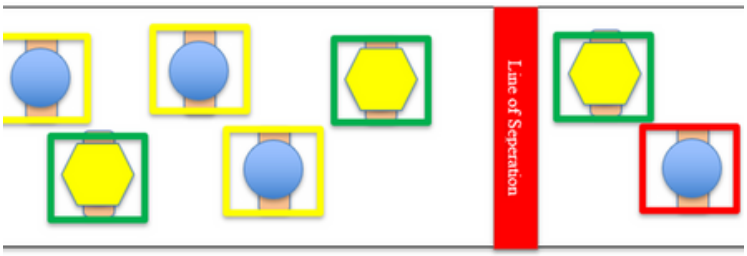
Ongoing Pilot Projects

Application of computer vision technology to monitor safety compliance in a public feed mill and grain science complex PI: Gretchen Mosher, PhD Iowa State University
Team members: Graduate students Elijah Bouwman and Jannatul Progga, faculty Hanwook Chung, PhD and Brett Ramirez, PhD

Previous research found that 70% of visitors entering a public feed mill did not follow PPE and other entry requirements. The project aims to use computer vision methods to monitor PPE compliance among facility visitors, measuring the accuracy, speed, and reliability of the computer vision detection of PPE presence, correct use, and duration.

A Sneak Peek at the Preliminary Results:

The team is training the model to identify images of safety helmets through image acquisition, data augmentation, object classification, and finally testing and validating the model.



- Green boxes to the left of the line of separation represent individuals wearing a hard hat correctly outside of the "unsafe" zone
- Yellow boxes to the left of the line of separation represent individuals not wearing a hard hat or not wearing the hard hat correctly outside of the "unsafe" zone
- Green box to the right of the line of separation represent individual wearing a hard hat correctly inside of the "unsafe" zone
- Red box to the right of the line of separate represent individual not wearing a hard hat or not wearing the hard hat correctly inside of the "unsafe" zone

The model has been coded in in Python and is currently being tested with a pretrained model of YOLO11s from Ultralytics. The current model is optimized for efficiency and speed. This project will test the speed of the model, but will also focus on the accuracy (whether the hard hat on/off is correctly classified) and the precision (the number of true positives and negatives versus the number of false positives and negatives). The team is currently planning for the next phase of the project to identify other areas within feed and grain facilities where computer vision technologies could be successfully applied.

An assessment of formal and non-formal safety education in secondary and post-secondary agricultural education.
PI: Jonathan Ulmer, PhD Kansas State University

A survey was conducted with current Kansas agriculture teachers on their knowledge of safety. An assessment of current safety classes, programs, and offerings at Kansas State University is being conducted to improve opportunities.

Project Highlights:

- 24 courses related to safety are being taught at Kansas State University. Classes range from one to three credit hours. They are in the Colleges of Agriculture, Health and Human Sciences, and Engineering.
- 305 Kansas Agriculture Teachers were surveyed for their knowledge of safety and the topics included in their instruction. 152 responses were received.
- Data analysis is continuing with plans to submit to the AAAE conference.

Survey Response Examples

"Honestly, this survey was good for me to think about how I could teach safety in many more areas of agriculture."
"I do have life experience in many of the areas brought forward that I never thought about."
"I would be interested in the curriculum for these areas."

Ongoing Pilot Projects

Developing Relevant Grain Handling Safety Education Videos for Spanish-Speaking Agricultural Workers

Catherine A. Rylatt, Grain Handling Safety Council

The Grain Handling Safety Council is developing a series of short Spanish-language videos focusing on safety practices for agricultural workers by translating and adapting English videos and developing new content, as appropriate, to fill in gaps. The focus is on hazards and safe practices encountered at work settings where grain is handled, stored, processed, and/or used, which encompasses a broad array of agricultural operations from crop farms, dairy farms, feedlots, elevators, and more. The content covers a variety of hazards and safe practices:

- general safety - hearing protection, emergency action plans, ladder safety, respiratory protection, etc.
- specific topics - bin entry, dump pits, sump grates, etc.

Thereby creating a durable resources that can be used in a wide variety of settings for training purposes.

The videos will be posted on the USAg Center website as well as partner websites to increase access and use.

Leveraging Satellite Data and Machine Learning to Protect Outdoor Workers from PM2.5 Exposure in Nebraska

Siddhi Munde (PI), Aaron Yoder, PhD (Co-I), Richard Remigio, PhD (Co-I)

We are generating PM2.5 exposure maps to evaluate air-quality risks for outdoor workers across Nebraska. There are key gaps in knowledge regarding worker protection from poor air quality. Retrospective satellite-based analyses are identifying high-risk exposure zones to inform occupational health strategies.

Project Highlights:

- Conducted literature review to identify major gaps in occupational air-quality protection and exposure assessment.
- Drafted a perspective paper outlining gaps and opportunities for improving worker protection from PM2.5 exposure.
- Processed multi-year satellite and reanalysis MERRA-2 data to develop retrospective PM2.5 exposure maps (2015–2024) for Nebraska.
- Exploring use of the Prithvi Earth foundation model for improving MERRA-2 downscaling and high spatial resolution PM2.5 exposure zones.
- Preparing an application to NASA's User-Centered Applications with Large Earth Foundation Models opportunity to expand this work using foundation models for high-resolution PM2.5 mapping and worker exposure analytics.

Occupational Health Hazards posed by Airborne Neonicotinoid Dust from Seed Treatments
Darrin Thompson, PhD (PI), University of Iowa

Neonicotinoids (NEO), commonly used as seed treatments for crops like corn and soybeans, can be found in airborne dust, potentially posing unique exposure risks to agricultural workers. Few studies have examined the health impacts of this exposure in the US. The study is collecting a mix of samples to test the hypotheses that a) dust is a source of exposure for agricultural workers and b) NEO concentrations in dust are a more significant source of human exposure compared to drinking water.

Project Highlights:

Enrollment - 28 people have been enrolled in the yearlong study. Participants enrolled through convenience sampling include a mixture of farmers and non-agricultural worker controls.
Sample collection is ongoing. Samples include several types including drinking water, soil, dust from surfaces, exterior and interior work and homes, dust collected from the air, urine, and nasal swabs. The sampling has been designed to give a comprehensive assessment of exposure throughout the year, in and outside of the home.

Analytical methods previously developed for neonicotinoids in water a mixture of 8 parent NEOs, 13 NEO metabolites, and 3 commonly co-applied pesticides, have been modified to test for these compounds in other matrices including water, soil, dust, and nasal swabs. These methods have also been expanded to include 19 fungicides and fungicide degradates, and three herbicides. Common fungicides include Azoxystrobin, Propiconazole, Tebuconazole, and Metalaxyl. The herbicides currently consist of Atrazine, Metolachlor, and Metribuzin.

Biospecimen- Preliminary data shows neonicotinoids in every urine sample. The most common parent has been Imidacloprid (53%) while Acetamiprid-n-desmethyl (72%) and Imidacloprid olefin (69%) were the most commonly detected.

Water/Soil/Dust – Drinking water results show low levels of neonicotinoids, fungicides, and herbicides. Significantly higher concentrations of these pesticides have been found in soil and dust samples suggesting potential to be a major source of exposure. Atrazine and imidacloprid were commonly found in the majority of dust/soil samples. Carbendazim a fungicide used in drywall so far is the most commonly detected fungicide (66%). The study has also detected neonicotinoids such as Acetamiprid and Dinotefuran that have rarely been found in Iowa water testing. Many of these analytes detected were not found on the different treated and untreated corn and soybean seeds collected from farmers at the beginning of the project.

Ongoing Pilot Projects

Adverse Health Outcomes From Pesticide Exposure in the Female Agricultural Workforce
Muhammad Zahid, PhD (PI), University of Nebraska Medical Center

Pesticide exposure can cause serious health effects. Women in agriculture face increasing risks due to growing involvement in pesticide application. This study proposes to monitor pesticide exposure's impact on estrogen metabolism and evaluate safety training effectiveness among female applicators.

Project Highlights:

- Partnering with the UNL's Nebraska Women in Agriculture program to recruit and disseminate findings.
- Recruitment efforts improved after directly contacting female applicators, emphasizing the study's importance, and offering a $50 reward for providing two samples, successfully enrolling 10 female participants.
- Developed a new detection method for glyphosate detection using a LCMS system,
- Currently running samples for glyphosate. The next phase will focus on analyzing glyphosate's effects on estrogen metabolism.

"Every hurdle pushes us to innovate and persist, reminding us that understanding pesticides' impact on women's health is far more important than the research challenges we are facing."

Project Website: https://wia.unl.edu/events/agrichemical-exposure-pilot-study/

Newly Funded Pilot Projects

Nebraska West Nile virus Immunity and Geographic Surveillance (NE-WINGS)
M. Jana Broadhurst, MD, PhD, UNMC Department of Pathology, Microbiology, & Immunology, UNMC College of Medicine; Joseph Fauver, PhD, Assistant Professor, and David Brett-Major, MD, MPH, UNMC College of Public Health

This project will establish a sustainable, community-based research infrastructure in western Nebraska to assess West Nile virus (WNV) exposure risk in agricultural workers. Dr. Broadhurst and her team will partner with the Panhandle Public Health District to create a Community Advisory Board and host research events for biospecimen and questionnaire collection. Using a lab-developed antibody profiling assay, the study will determine WNV seroprevalence and guide future rural health initiatives in the Great Plains.

Age-related changes in lung mesenchymal stem cell responses to agricultural organic dust exposure
Dannielle Samano, MD, and Kristina Bailey, MD, Professor, Division of Pulmonary, Critical Care & Sleep Medicine, UNMC

This study will investigate how aging impacts the lung's mesenchymal stem cells (L-MSCs) when exposed to agricultural organic dust, a common risk in farming. By comparing younger and older donor cells, the research team will focus on inflammation, wound healing, and mitochondrial function. This work aims to better understand why older farmers may be more susceptible to respiratory diseases, with the long-term goal of identifying protective therapies.

Newly Funded Pilot Projects

Agricultural Work Exposures, Nutrition, and Neurodegeneration Risk
Kelli Gribben, PhD, MPH, Postdoctoral Research Associate; Casey McDermott, MS, Graduate Student; Tara Nordgren, PhD, Associate Professor; Corrine Hanson, PhD, RD, Professor, UNMC

This project will explore how exposure to agricultural dust might contribute to neurodegenerative diseases such as dementia and whether omega-3 fatty acids (n-3 FAs) offer protective benefits. Using a combination of mouse models and data from the AgCOPD veteran cohort, the project will analyze links between dust exposure, diet, inflammation, and biomarkers of brain health. The research could inform preventive dietary strategies for at-risk agricultural populations.

Using Machine Learning to Predict Fall Risks in Aging Agricultural Workers Across Farming Seasons
Dr. Ka-Chun (Joseph) Siu, PhD, University of Nebraska Medical Center, College of Allied Health, Jan Moore, PhD, Co-I, University of Nebraska Kearney, Jong-Hoon Youn, PhD, Co-I, University of Nebraska Omaha

With the average age of U.S. farmers now 57, this interdisciplinary team will address the pressing need to reduce fall injuries in this population. The research will examine how hearing loss, cognitive function, and seasonal workload affect balance and fall risk. Participants will undergo hearing and cognitive assessments and wear devices that monitor their activity during both high- and low-intensity farming periods. The goal is to develop machine learning models that can identify fall risks early and guide interventions.

LEARN MORE ABOUT OUR CURRENT AND PAST PILOT PROJECTS
Visit go.unmc.edu/pilot-projects
Or use your smartphone to scan the QR code.

OUTREACH PROGRAM

From Benchtop to Boots in the Field: Transforming Research into Outreach

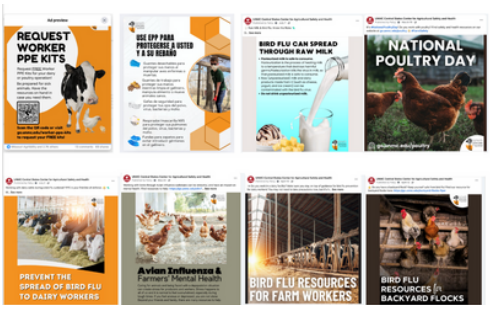
The CS-CASH outreach program promotes interventions that the agricultural workforce, their families, and communities can effectively adopt and sustain across the region and the nation, thereby contributing to long-term improvements in agricultural worker health and safety. Throughout the past year, the outreach team conducted training and responded to emerging issues serving agricultural producers and workers, vulnerable worker populations, and rural healthcare providers. We continue to work with partner organizations, including the AgriSafe Network, Ag Health and Safety Alliance, USDA Extension Service, AgrAbility, Grain Handling Safety Coalition, Farm Bureau, Women in Agriculture Organizations, agri-insurance, media organizations and journalists, and other NIOSH-funded Ag Centers.

Debra Romberger, MD; Eric Ernest, MD; Ellen Duysen, MPH

Emerging Issues: Response to the H5N1 outbreak in poultry and dairy facilities.

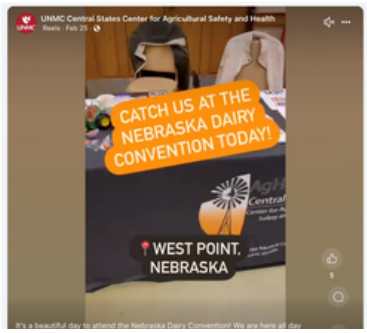
Communicating Risk, Training for Prevention, Protecting Workers

Targeted Social Media Posts



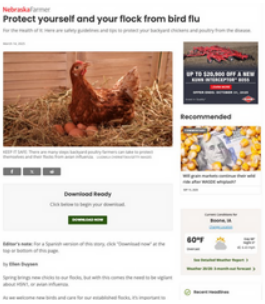
Podcasts

Dariry and Poultry Conferences



RFD TV

Farm Journal Articles



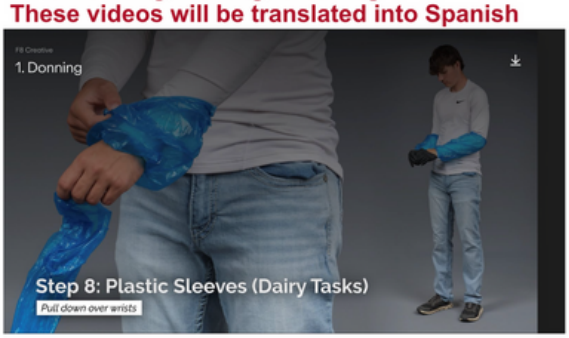
Healthcare Trainings

UNMC College of Public Health - HPAI and PPE Training during the Annual Ag Health and Safety Course

Videos – HPAI PPE - Dairy and Poultry Producers

N=3 Donning, Doffing, Cleaning

These videos will be translated into Spanish



HPAI Prevention Kits

>3200 distributed and counting

DISCOVER MORE CS-CASH AVIAN INFLUENZA (BIRD FLU) RESOURCES

https://go.unmc.edu/avian_influenza_resources

Or use your smartphone to scan the QR code.

Reporting Injury, Illness, and Stress in the Central States Region

The outreach team worked closely this year with Dr. Risto Rautiainen to track injuries and fatalities in our 7-states region using news clip data, and to develop prevention resources in response to emerging issues and reoccurring threats to safety and health. The team created a map of injury and fatalities in the CS-CASH 7-states region.

VIEW NEWS CLIPPING MAP
https://go.unmc.edu/injury_fatality_map
Or use your smartphone to scan the QR code.

CS-CASH Social Media Platforms & Stakeholder Reach

Media	Reach
Website go.unmc.edu/cs-cash	18,423 total views in the year 8,433 unique users in the year
Facebook @unmccscash facebook.com/unmccscash	1012 followers 413 posts in the year 217,846 post views
Instagram @unmccscash instagram.com/unmccscash	159 followers 413 posts in the year 344 post engagements
Flickr @cscash flickr.com/photos/cscash	3,262 copyright free ag safety and health photos 1,275,306 lifetime views
U.S. Ag Center YouTube @USagCenters youtube.com/usagcenters	U.S. Ag Center collaborative channel – 191 videos CS-CASH created 34 of the videos Channel videos have 871,590 views, 4057 subscribers

CS-CASH Newsletter

The CS-CASH newsletter is sent to over 3000 agricultural employers, safety professionals, researchers, industry stakeholders and the Center's partners four times a year. The newsletter informs readers about new CS-CASH educational resources, funding announcements, and training opportunities as well information from our community and research partners.

LEARN MORE ABOUT THE CS-CASH NEWSLETTER
Sign up & view past issues: Visit go.unmc.edu/cs-cash-newsletter

Regional Print & Live Media Interviews

CS-CASH members continued to offer their expertise to regional and national newspapers, agricultural trade journals, radio, podcasts, and TV, addressing health and safety issues relevant to agricultural audiences. Some of the 2024-2025 articles and broadcasts can be found on the CS-CASH website.

VIEW REGIONAL PRINT & LIVE INTERVIEWS

Visit go.unmc.edu/cs-cash-other-media

VIEW CS-CASH FARM SAFETY ARTICLES IN FARM PROGRESS MAGAZINE

https://go.unmc.edu/articles_farmprogress

Read All About It!

Since December 2023, CS-CASH has published a monthly column entitled "For the Health of It" in Farm Progress Media Ag Journals and in their electronic journal. The online article consistently ranks among the top 5 viewed articles. Each article is translated into Spanish. This is the first monthly column for Nebraska Farmer that has been available in both English and Spanish.

VIEW CS-CASH MEDIA RELEASES

Visit go.unmc.edu/cs-cash-news

Traing Healthcare Providers Since 2011 - *CS-CASH Agricultural Safety and Health Course*

- Since 2011 CS-CASH has hosted a 34-hour Agricultural Safety and Health Course at the UNMC College of Public Health.
- 1170 students have attended.
- The course includes a 4-hour farm tour.
- As a "Thank You to Healthcare Providers", this course has been offered free of charge since 2020.
- The course is eligible for AMA, Nursing, and EMS continuing education credit (34 hours) as well as academic credit.
- In 2025 there were 88 online and in-person attendees.

Collaborating on Outreach with Regional & National Organizations

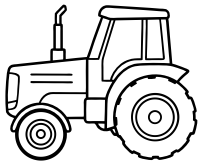
CS-CASH outreach and research teams are always on the look-out for partners including farmers, ranchers, ag industry, healthcare providers and other safety and health professionals. Working with our trusted collaborators and an extensive network of organizational contacts we have been able to multiply our impact and reach. Some of our partnerships in the past year are listed below.

Some of our amazing partners

Extension

In collaboration with **Nebraska Extension** we support the maintenance of the ATV Simulator, a full sized ATV on a rocker table that is transported on a trailer. The simulator is part of the **ATV Aware** curriculum and is used for training across Nebraska, including the Nebraska State Fair and several other large multi-day events.

Find out more about ATV AWARE: https://go.unmc.edu/atv_safety



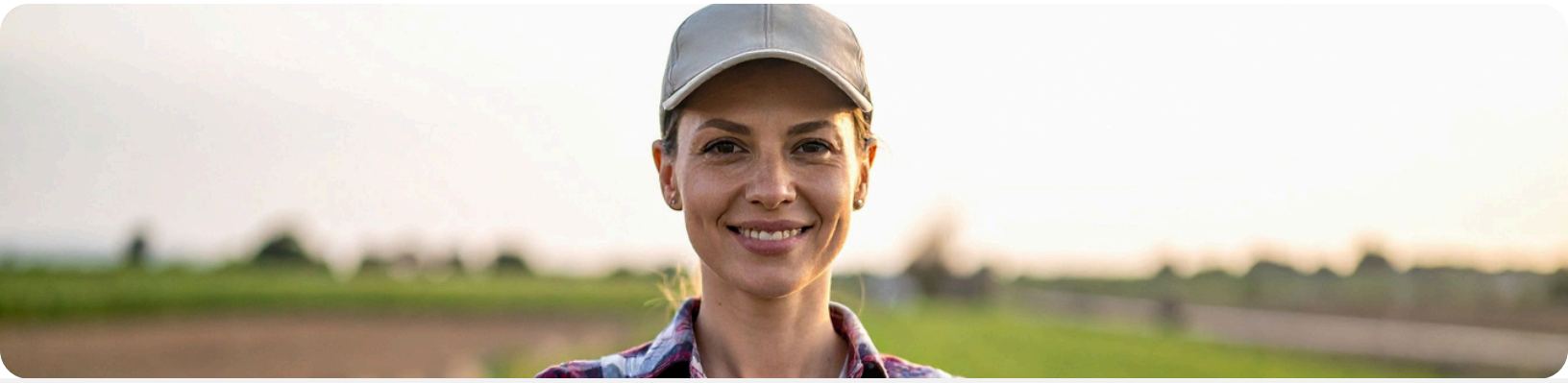
In partnership with **Nebraska Extension,** CS-CASH provided annual hands-on training to fulfill requirements for young workers to become certified to operate tractors and equipment. Using the **National Safe Tractor and Machinery Operation Program (NSTMOP)** curriculum and extensive add-on trainings such as Stop the Bleed, emergency response, PPE, and ATV Aware, in 2025 63 students at 10 locations received certification during the 2-day training. Students successfully completing this training are able to receive an animal husbandry permit from their DMV state office.

Find out more about CS-CASH Tractor Safety Training: https://go.unmc.edu/tractor_safety

As part of the National Extension, Dr. Aaron Yoder was instrumental in developing the **Farm & Ranch eXtension in Safety and Health (FReSH) Community of Practice (CoP) at eXtension.org**. This collaborative effort between universities, industry, and government provides user-friendly information for the general rural population, agricultural producers, and agricultural safety and health professionals. New resources were added and the website received an update.

CS-CASH works closely with **Extension Women in Ag** programs by providing educational content and training as part of webinars, annual conferences, and speaking engagements. This partnership has been essential for getting information out to those who work in ag and serve as the safety gatekeepers on their farms and ranches.

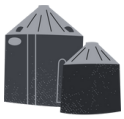
Find out more about Safety for Women in Ag: https://go.unmc.edu/womens_safety_health



Some of our amazing outreach partners (cont)

National Safety Organizations

CS-CASH continues a long-term, successful partnership with the **Progressive Ag Foundation (PAF)**, last year presenting and providing resources for **27 PAF Safety Day** trainings throughout the CS-CASH 7-states region and **hosting 3 PAF Safety Zones**. Training included hearing conservation, sun safety, ATV/UTV safety, PTO safety, zoonotic disease, stress reduction techniques and respiratory protection.
Find out more about Progressive Ag Foundation: https://www.progressiveag.org/about



In collaboration with the **Grain Handling Safety Coalition**, **the OSHA Alliance, and CVA Cooperative** CS-CASH outreach members presented webinars and in-person training to grain handling industry workers on Grain Bin Entry, Lock Out/Tag Out, Heat Stress, and Respiratory Protection. For the 6th year, CS-CASH partnered in the annual **Stand-Up for Grain Safety Week** trainings.
Find out more about SU4GS Week: https://standup4grainsafety.org/

Developed by Dr. Aaron Yoder in collaboration with **Penn State University and Ohio State University, AgSafety4u** (Level 2) is a web-based training module that provides an overview of identification and control of hazards common to farms and agriculturally related rural businesses, focusing on hazards associated with machinery, structures, equipment, animals, chemicals, and outdoor environment. Dr. Yoder continued to provide updates and expanded the web-based training tool this past year.
Find out more about AgSafety4u: https://ag-safety.extension.org/agsafety4u-certificate-course/

Along with researchers at **Ohio State University and Utah State University**, Dr. Yoder is a PI on the **Safety in Agriculture for Youth** (SAY) grant, a project funded by the US Department of Agriculture (USDA), National Institute of Food and Agriculture to develop a sustainable and accessible national clearinghouse for agricultural safety and health curriculum for youth. In collaboration with SAY, CS-CASH participated in the 3-day safety exhibit at the National FFA Convention reaching approximately 2,500 youth and their instructors with educational training.
Find out more about SAY: https://ag-safety.extension.org/safety-in-agriculture-for-youth/

CS-CASH provided "spooky" outreach at the 2024 National FFA Convention - providing training and education on zoonotic diseases and Stop the Bleed

Some of our amazing outreach partners (cont)

Agricultural Safety Center Outreach Collaborations

The CS-CASH outreach team maintained and established cross-center collaboration with all centers in multiple areas of mutual interest over the past year. Coordinated outreach efforts proved impactful.

US Ag Center YouTube Channel

CS-CASH continues to work with all of the **NIOSH AFF Centers** on the **USAg Center YouTube Channel.** Established in 2013, the AFF Centers collaborated to initiate a joint YouTube channel to raise awareness of agricultural, forestry and fishing occupational hazards; provide information to prevent AFF injuries and illnesses. Dr. Aaron Yoder continues to serve as the USAg Center YouTube webmaster and Ellen Duysen continues to manage the comments and reporting site analytics to the Centers.

USAg Center YouTube Channel

📺 **Subscribers: 4,061**
👤 **Lifetime Views: 872,500**
⏳ **Watch Time Hours: 73,321**

Visit the USAg Center YouTube Channel: https://www.youtube.com/user/USagCenters

Coordinated Outreach at Ag Shows

Over the past year, CS-CASH partnered with the **Iowa, Minnesota, and Wisconsin NIOSH-funded Agricultural Health and Safety Centers** to deliver coordinated outreach at four major farm and ranch events across the Center's seven-state region. These three-day events allowed outreach teams to engage large numbers of farmers and ranchers with training, personal protective equipment, and educational materials. This collaboration expanded the reach and effectiveness of our outreach efforts.

The Telling the Story Project -www.tellingthestory.org

Since 2016, CS-CASH has collaborated with UMASH and NCCRAHS on the "Telling the Story Project," a translation initiative that delivers ag injury prevention messages through first-hand personal narratives. These stories, along with related prevention resources, are housed on a dedicated website that has received over 42,000 visits. This year, the project's reach expanded even further as its content was incorporated into the curriculum of a University of Minnesota agricultural journalism course.

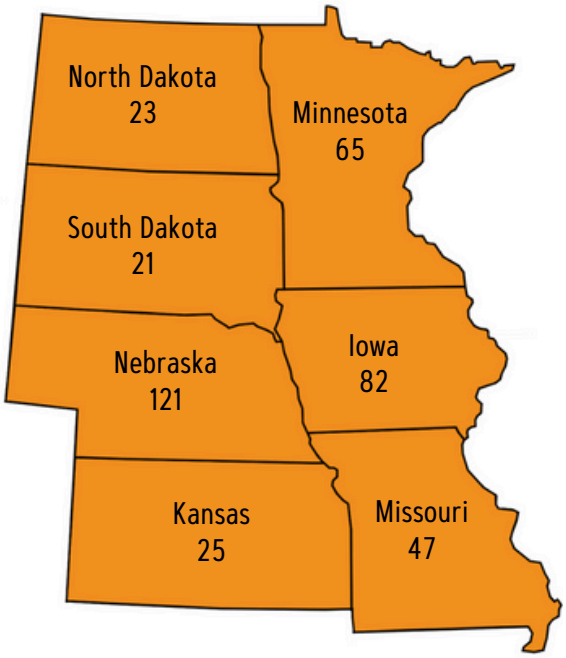
Visit the Telling the Story Project Website https://tellingthestoryproject.org/

CS-CASH OUTREACH ACTIVITIES BY THE NUMBERS
SEP 1, 2024 - AUG 31, 2025

139 course/curriculum, material distribution, training demonstration, workshop, conferences

347 oral presentations, posters, reports, non-peer reviewed articles, educational materials, consultation, interviews, newsletters, videos

REGIONAL OUTREACH ACTIVITY

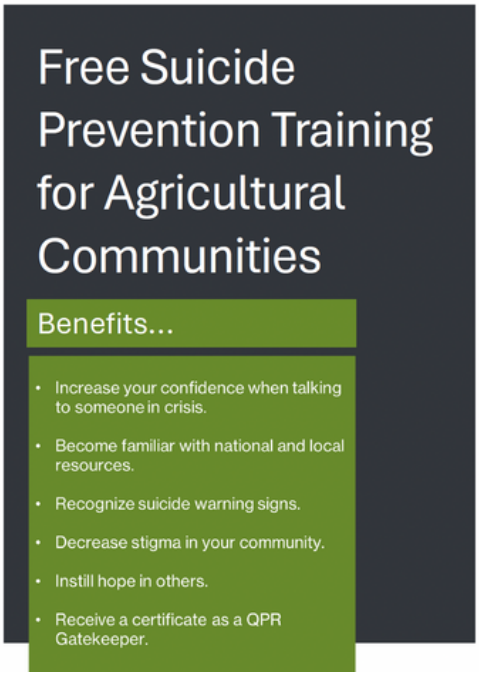


Mental Health Awareness: Increasing Capacity among Agricultural Communities

Collaboration with The AgriSafe Network

This project aims to strengthen mental health support within agricultural communities by increasing the capacity of health professionals to identify and treat farmers who may benefit from mental health services and resources. It also seeks to equip rural residents with the skills to recognize when farmers may need help and to refer them to appropriate services. Ultimately, the project's goal is to reduce suicide rates among Midwest farmers by implementing evidence-based suicide prevention training across agricultural communities.

Providing Free Suicide Prevention Training in the CS-CASH Region



Find out more about these important trainings
QPR: https://www.agrisafe.org/courses/qpr/
CALM: https://www.agrisafe.org/courses/calm/

> *Thank you for giving the perspective that it is okay to ask others about their feelings of suicide and how this can lead to prevention overall.*
>
> CALM Program evaluation response

Mental Health Awareness: Increasing Capacity among Agricultural Communities

Additional Mental Health Training and Professional Development Promotions

CS-CASH Ag Health Course
With an intentional behavioral health and wellness focus on female producers, AgriSafe trained 83 participants enrolled in the CS-CASH Ag Health course. This comprehensive session addressed health disparities among women in agriculture and explored strategies for improving wellbeing.

NIH Research Grant Collaboration
Dr. Tara Haskins partnered with Dr. Cheryl Besler at UNMC to submit an NIH research grant proposal focused on best practices for rural communities and healthcare providers implementing lethal-means suicide prevention training. Nebraska is identified as one of the target states for this research.

Health Care Systems Collaboration
AgriSafe collaborated with the Nebraska Hospital Association to train 150 critical access hospital clinicians and administrators in the Total Farmer Health model, providing a holistic framework to support the mental health needs of Midwest farm families

Producer Publication
Linda Emanuel authored an article addressing mental health challenges in beef production and offering coping strategies for producers and their families. The publication reached 2,600 digital readers and 15,000 print readers.

University of Nebraska Extension Engagement
Through monthly collaboration with the Nebraska Extension Rural Family Stress and Wellness Workgroup, AgriSafe helps increase awareness of producer stress, effective coping strategies, and available CS-CASH and AgriSafe resources.

Talking Total Health Podcasts
Mental health and wellness themes were integrated throughout FY 3 episodes, resulting in 157 listens and expanded narrative reach.

Social Media Reach
CS-CASH mental health and wellness content generated an estimated 509,019 potential impressions across social media platforms.

LISTEN TO TALKING TOTAL FARMER HEALTH
Visit agrisafe.org/podcasts/talking-total-farmer-health/
Or use your smartphone to scan the QR code.

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