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.

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 and other Ag Center, and works towards fulfilling our common mission to improve health and safety and reduce the burden of injury and illness in agriculture.

Key Personnel

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<td>Risto Rautiainen, PhD, MS</td>
<td>Center Director</td>
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CS-CASH Website: [www.unmc.edu/publichealth/cscash](http://www.unmc.edu/publichealth/cscash)
CS-CASH Facebook page: [https://www.facebook.com/unmccscash/](https://www.facebook.com/unmccscash/)
CS-CASH Twitter: [@unmc_CSCASH](https://twitter.com/unmc_CSCASH)
Section II Program/Project Highlights
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

   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

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

   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 program in reducing the number and cost of injuries and illnesses, and improving the safety culture on participating feedyards.

In 2014, the occupational fatality rate was 116 fatalities/100,000 workers in the beef cattle ranching and farming industries (including feedyards). This rate was four times higher than the rate in the agriculture, forestry, and fishing sector overall (24.9/100,000) and 34 times higher than the rate in all industries combined (3.4/100,000). The cattle feedyard subsector also has exceptionally high non-fatal injury and illness rates. In 2013, hired workers in the beef cattle ranching and farming (including feedyards) had a “days away from work” rate of 258.8/10,000 while the rate for all industries combined was 99.9/10,000. These high injury, illness and fatality rates may be partly due to high turnover among feedyard employees. Many come to work in this industry with little experience and no safety training, and many come from Central America with limited language skills. There is increasing recognition that reducing injuries and illnesses among workers is a critical part of retaining a skilled workforce, decreasing losses and improving sustainability of the operation.
The Central States Center for Agricultural Safety and Health (CS-CASH) is ideally located to conduct feedyard research as half of the feedyards in the US are located in the Center’s region. In 2015, the Center’s seven-state region (IA, KS, MN, MO, NE, ND and SD) had 556 cattle feedyards and 6687 feedyard employees. Preparing for this project, CS-CASH hosted a roundtable discussion of major stakeholders regarding the prevention of injuries and illnesses in the feedyard industry. The roundtable recommendations emphasized the need for safety training, particularly for new employees. This project was developed with these recommendations in mind.

Progress – Year One:

- The Feedyard Safety Advisory Board (FASB) has been created to gather input and promote health and safety more broadly in the feedyard sector. The FSAB has met twice in face-to-face meetings and has provided input on several aspects of the developing program.
- A Feedyard Safety survey instrument was developed and has been disseminated to Feedyards across the CS-CASH region. Results are being analyzed.
- Working in collaboration with Gallagher Insurance, one of the largest feedyard insurers in the U.S., Dr. Casper Bendixsen has begun collecting safety culture information from feedyard managers and workers through site visits known as multi sited ethnography.
- The project team has begun reviewing existing feedyard safety and health programs. A selection of these materials is currently being translated into Spanish.
- The project team has developed a structure for a commendation program to recognize feedyards that conduct monthly safety trainings for twelve consecutive months. Feedyards are currently being recruited to participate in this commendation program. Throughout this first year of the project several feedyards have expressed interest in participating in the program and a relationship with the Nebraska Cattlemen has been formed that has led to increased participation from their members.

Publications and Presentations.


Health & Safety Risks Among Immigrant Cattle Feedyard Workers in the Central States Region ||
Dr. Athena Ramos

Project Aims:

1. 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 educational and policy materials designed specifically for cattle feedyard operations.

Cattle production is an economic driver for the United States, producing $76.4 billion of economic impact in 2014. Cattle feedyards represent a $36.4 billion industry with the highest production concentrated in Nebraska, Texas, Kansas, Iowa, and Colorado. According to the U.S. Bureau of Labor Statistics, 52.5% of the workforce is Hispanic/Latino, and many of these workers are immigrants. Unfortunately, limited data exists about the health and safety of immigrant feedyard workers. Understanding Latino immigrant cattle feedyard workers’ health status, unique risk and protective factors, and specific occupational educational and training needs are imperative to addressing the health and safety risks within cattle production and the long-term economic impacts of such problems.

Progress Year 2:

- 80 research interviews have been completed with immigrant cattle feedyard workers in both Nebraska and Kansas. Interviews are anticipated to continue through July 2019.
- We have held eight team meetings to discuss progress relating to recruitment of participants, what we are learning, and how we can share what we are learning with others.
- Our team has presented preliminary research findings at the International Society of Agricultural Safety and Health Conference and the Cambio de Colores Conference. We will also be presenting at the Midwest Rural Agricultural Safety and Health Conference in November 2018.
- Members of the team participated in the Nebraska Cattlemen Annual Convention and in response to discussion at the meeting developed a bilingual (English/Spanish) fact sheet on bovine tuberculosis.
• Team members regularly participate in professional development activities, and the PI completed Beef Quality Assurance (BQA) certification.
• We continue to build relationships with organizational partners including: AgriSafe Network and the Nebraska Migrant Education Program.

The project team meets quarterly to review the progress and report on new developments. Team members include a physician, social-science researchers, and community health experts, safety professional and medical interpreters.

Back row (left) Antonia Correa, Kathleen Grant, Ellen Duyse, Gustavo Carlo, Rodrigo Gamboa, Axel Fuentes
Front row (left) Natalia Trinidad, Athena Ramos, Marcela Carvajal-Suarez

Publication:

Presentations:


Increasing personal Protective Equipment Use by Point Source Protection Strategy in Agriculture || Dr. Chandran Achutan

Project Aims:

1. Assess the participants’ baseline PPE use and exposures as potential targets for intervention.

We will conduct comprehensive on-farm exposure and current PPE use assessments using the Certified Safe Farm review procedure. Our working hypothesis is that at baseline, participating farmers and workers will have work situations where known exposure limits are exceeded, and that their current PPE use is not adequate to protect them from hazardous exposures, potentially leading to work-related illnesses.

2. Conduct a randomized controlled trial to test if the point source protection strategy (PSPS), placing customized PPE Boxes near targeted exposure sources, increases PPE use.

We will conduct a trial where intervention farms receive needs assessment, training, and customized PPE Boxes placed in targeted high exposure sites. Control farms receive similar assessment, training, and PPE but no placement in Boxes at exposure sites. Our working hypothesis is that farmers in the PSPS group will significantly increase their PPE use while only modest gains are observed in the control group.

3. Evaluate the feasibility and demand for the Point Source Protection Strategy and PPE Boxes. We will analyze the feasibility and demand for the PSPS; work settings where it is most/least helpful, and the readiness among farmers/ranchers to purchase and install PPE Boxes in different exposure areas. We will use outreach events and focus groups to gather information on farmer perceptions. Our working hypothesis is that there is considerable demand for well-designed PPE Boxes, if they were available on the market.

Progress Year 1.

- Recruited extensively throughout Nebraska. We have recruited using farmer databases and referrals from a rural physician. We have also handed out flyers and post cards at large fairs and trade shows frequented by farmers. We have recruited approximately 10 farmers, and plan to recruit an additional 40 by the end of the year.
- Developed an Access database to store information about the study participants and information about the specific PPE needs of the participants.
- Visited farms to obtain informed consent from the farmers, to evaluate their current PPE use and to take an inventory of potential hazards on their farm.
- Identified that farmers think that they use PPE when they should but upon closer questioning, farmers are typically not sure what PPE they need and when. One farmer said that he uses gloves when handling pesticides, but does not know if the gloves are appropriate. He uses what he can get for free from trade shows or from a chemical supplier. Another farmer said welding fumes were a hazard, but he will not wear adequate PPE because of discomfort. In addition, he said that his welding shed did not have adequate ventilation and that there is always smoke lingering in his shop. Farmers know that they should use “masks” for some tasks, but do not know that what “masks” are appropriate to prevent dust exposure and exposures from painting fumes. One farmer uses a handkerchief when exposed to dust. Farmers were also not aware that they should be fit tested for respirators.
- Demonstrated the correct way to put on and take off PPE.
• Farmers shared several stories of injuries and close calls. One farmer, when asked if he uses any PPE with chainsaws, said that his daughter sliced herself with a chainsaw the preceding year. Another discussed his son-in-law’s cancer, thought to be agriculture-related.

• We have purchased respirators, ear plugs, ear muffs, safety glasses (that can be worn over prescription glasses), and gloves for the farmers in our study. During our next visit, we will provide these PPE to the farmers. We will also offer them a free fit testing of their N95 or P100 respirators. We will assess their use of these PPE by having them complete a short survey by email or on a postcard.

Farmers enrolled in the study are interviewed to determine what personal protective equipment (PPE) they currently use and where the PPE is stored. Researchers Dr. Chandran Achutan (left photo, right side) and graduate student Kelsie Musil (right photo, left side) are shown during farm interviews. Some of the inventoried PPE is shown below.
Enhancing the Health and Safety of Range Bison Herd Workers || Dr. Clayton Kelling

Project Aims:

To characterize injuries and hazards associated with working bison under contemporary conditions on tribal reservations and on non-reservation facilities, develop and implement intervention strategies to mitigate worker safety risks and assess outcomes and impacts of intervention strategies, and disseminate updated intervention strategies widely to bison herd managers and workers.

The bison industry is growing in the central states of the US with many tribal communities introducing herds into their agricultural operations. Tribal bison workers may have little to no training on the safe handling of livestock prior to working with these dangerous animals. Untrained workers and poor working conditions make bison handling a particularly hazardous occupation.

During the second year of this project data collection continued at project herd locations. Safety-assessment forms, created specifically for this project, were used to score facility hazards and hazardous practices during roundups and processing in fall and winter of 2017-2018. On-site assessments were conducted by the PI and trained study personnel. Safety surveys were also competed by herd managers. These data were coded and will be used to analyze each site’s progress. Hazard assessment was based on industry standards: use of electric prods, collision with head gate, chute exit speed, etc.

To date tribal and nontribal bison facilities in Montana, South Dakota, North Dakota, Nebraska, Kansas and Iowa have been visited. One worker injury was observed during the observation period. The primary safety issues observed on reservation sites included unsafe approaches to rounding up bison, inadequate bison confinement practices, faulty ready chute design, lack of safety barrier fence, poorly maintained and dysfunctional squeeze chutes, and high stress bison handling practices. Upon recommendation by the research team, a modern portable hydraulic chute was ordered to replace an existing chute used at a tribal herd location. Safety panels have been installed at sites, providing a barrier between the bison and the head chute workers. Recommendations are shared following each visit with bison herd managers. Interventions to address worker safety issues are outlined in the report.
Onsite visits to bison facilities have been scheduled for fall 2018. Research staff collect the injury reports and interview managers yearly. An overall facilities and animal handling safety score will be calculated and tracked for each herd. Injury, working condition, animal handling, and hazard score variables will be constructed and compared between reservation and non-reservation facilities. Changes in these indicators will be measured within each group.

Examples of information returned to herd managers are shown below.
Surveillance || Dr. Risto Rautiainen

Project Aims:

1. Conduct annual agricultural health and safety surveys in the Central States region, linked with existing data on farm production and operator characteristics from the Farm Market iD database. Injury, illness and exposure data are collected using online, mail and telephone surveys to enhance response rate and data quality.

CS-CASH has conducted agricultural injury surveillance since 2011. During the first five years (2011-2015) USDA National Agricultural Statistics Service (NASS) administered data collection and CS-CASH analyzed the data. Reporting of results continues with several manuscripts under preparation.

1. Conduct annual surveys of agricultural injuries in the Central States region, linked with existing data on farm production and operator characteristics from the Census of Agriculture. We aim to augment current mail surveys with calls to non-respondents to improve data quality and to reduce biases.

2. Explore alternative surveillance methods for injuries and illnesses, including analyses of ‘big data’ from existing administrative databases, automated online surveys, and media tracking services, thus expanding the evidence base for prevention.

In 2017-2018 CS-CASH developed a new method for agricultural safety and health surveys. CS-CASH obtained contact and farm production information from Farm Market iD, and Center staff administered all aspects of the survey in-house. The first round of data collection was completed and data entry and analyses are in progress.

The survey was administered in four steps: 1) email with a link to an online survey, 2) repeat email to non-respondents, 3) paper survey by mail to 16,826 farm and ranch operations, and 4) repeat paper survey to non-respondents. The survey covered the center’s seven-state region (IA, MN, MO, KS, NE, ND, and SD). Small prices (value $100-$500) were used as an incentive to respond. A total of 3164 responses were received for an overall response rate of 19%. This rate was lower than the average rate in previous NASS surveys (31%), but the number of responses was higher (2197 on average in NASS surveys) due to increased sample. In addition to injuries, the survey was expanded to include health conditions (respiratory, hearing, skin, stress, musculoskeletal), as well as exposures and protective measures related to these conditions.

Preliminary analyses indicate that a high percentage (90%) of principal operators had farming/ranching as their primary occupation (vs. approximately half in previous surveys and the Census of Agriculture). The rate of reported injuries more than doubled from 7.1% (NASS) to 14.9% in the new survey. The characteristics of injuries were similar; 27% were caused by livestock, 5% by tractors, 4% by ATVs, 18% by other machinery, and the rest by tools, structures, surfaces, and other sources (Figure 1). The average medical expenses for the treatment of injuries were $15,261; $3259 out of pocket and $12,002 paid by insurance. The prevalence of health conditions included respiratory (18.9%), hearing (65.4%), skin (20.0%), stress/sleep deprivation/fatigue (46.7%), and musculoskeletal (65.6%) symptoms or conditions. Analyses and reporting of the results continues during the next fiscal period.

CS-CASH conducted ongoing media monitoring of agricultural injury and fatality cases. Analyses of 2012-2017 data show that CS-CASH media monitoring captured 1048 injury cases; 586 (56%) were non-fatal and 462 (44%) were fatal. Most cases (85%) were captured from print media, which included a higher proportion of non-fatal injuries (58% vs. 41%) and roadway injuries (52% vs. 30%) compared to online reports. The numbers of fatality cases from media monitoring and CFOI were almost identical.
(280 vs. 282, respectively), and the distributions by type of injury were similar. The findings suggest that media monitoring can capture equal numbers of fatalities compared to CFOI. Media monitoring can provide timely access to detailed information on individual cases, which is important for designing interventions and detecting emerging hazards.

The surveillance project investigators collaborate with other investigators, centers and organizations nationally and internationally to gain a better understanding of injury and illness incidence, prevalence and surveillance methods in the Agriculture, Forestry and Fishing industry.

Figure 1.

![Injuries by cause/source of injury](source: CS-CASH Injury Survey)

Publications:


Presentations:


Website:

Summary of 2011-2015 injury surveillance data, and state by state summaries of media monitoring data are available on the CS-CASH website: [https://www.unmc.edu/publichealth/cscash/](https://www.unmc.edu/publichealth/cscash/)
Agricultural Dust-Induced Airway Injury and Repair: An IL-10 Centered Approach
Dr. Todd Wyatt and Dr. Jill Poole

Project Aims:


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.

The long-term goal of this project is to determine molecular targets and approaches to accelerate lung repair following agriculture dust-induced airway injury to ultimately improve the health of exposed workers. The central hypothesis of this proposed project is that the anti-inflammatory/pro-resolving IL-10 cytokine is central for enhancing repair response to agriculture dust-induced airway injury.

Progress Year 2.

We have made significant progress in all three aims. First, we have established the normative, time-dependent post-inflammatory homeostasis recovery and resolution phase following swine confinement organic dust extract (ODE)-induced lung disease in an animal model. These results are now published in the journal, Safety (Warren 2017). In addition, new directions related to the project have identified the role of amphiregulin in lung macrophages and ILC2 in repair from dust injury (Nordgren 2017).

Another direction related to the project is the novel finding that organic dust exposure can impact bone loss as well as stem cell responses in exposed workers. These findings are now published (Nelson 2018 and Nordgren 2018). This line of research has resulted in a new multi-year research grant funded by the Department of Veterans Affairs to CS-CASH Outcomes Core Director, Debra Romberger.

In aim 2, we have optimized the experimental assay and conditions utilizing a murine lung macrophage cell line (MH-S) demonstrating significant ODE-induced IL-10 production in a dose-and time-dependent manner. We are reproducibly able to detect IL-10 protein release following ODE exposure. The results of this work was published in abstract form in May of 2018 (Chandra 2018). Furthermore, we have now demonstrated that pre-treatment of macrophages ex vivo with IL-10 prior to stimulation with ODE results in significant reductions in TNF-alpha release. In corollary, pre-treatment of animals with recombinant IL-10 reduces the macrophage responses, particularly TNF-alpha release. These findings are being prepared for publication.

In aim 3, we completed running ELISA determinations of IL-10, IL-6, and TNF-α protein measurements on the supernatants collected from the whole blood assay on the human subject participants of the AgCOPD cohort (N>600 subjects). Our statistical analysis reveals that the responsiveness to organic dust, as measured by TNFa and IL-6 production, is predicted by high IL-10. Namely, increased IL-10 levels significantly correlate to less TNF-α and IL-6. Furthermore, a high IL-10 concentration is highly correlated with high FEV1/FVC. The results from these studies are now published in Respiratory Research (LeVan 2018).

Summary of Translational Impact: Our goal is to develop improved approaches to therapeutics and practice that will positively impact respiratory symptoms and disease in agricultural workers exposed to...
organic dusts from large-scale animal production. Our studies are the first to focus on the repair and recovery response following agricultural exposure-induced airway injury.

Organic dusts from concentrated animal feeding operations cause inflammation by increasing inflammatory cytokines such as tumor necrosis factor alpha (TNFα) through a toll-like receptor pathway (TLRs). Response to such inflammation can come in the form of anti-inflammatory mediators such as interleukin-10 (IL-10), which inhibit TACE, the enzyme responsible for TNF release, via the activation of tissue inhibitory metalloproteinase 3 (TIMP3). We have found that IL-10 can be regulated by differential expression of scavenger receptor (SRA) and protein kinase C zeta (PKCζ). Such protein expression differences may lead to a better understanding of how individual workers respond differently to dust exposure.

Outcomes:

Publications Related to this Project:


Abstracts Related to this Project:


Presentations/Outreach Related to this Project:

Pilot Program || Dr. Eleanor Rogan

An essential program within CS-CASH is the Pilot Program that supports pilot and feasibility projects, with the goal of enabling investigators to collect preliminary data to support 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/or feasibility projects funded from this Center will result in subsequent grant submissions to NIOSH 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 clearly lead to future, more extensive study of the selected critical issue. In first seven years of funding CS-CASH has funded 42 pilot projects. Using data generated from these projects, investigators have generated $8,978,049 in additional funding (Figure 1). Information on the Pilot Program funding sources is outlined is also outlined in figure 1 below.

Figure 1.

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\(^1\) University of Nebraska Medical Center Office of the Vice Chancellor of Research;  
\(^2\) University of Nebraska – Lincoln Office of the Vice Chancellor of Research

Recognizing the research impact that has been made by these pilot grants, Dr. Jennifer Larsen, University of Nebraska Medical Center (UNMC) Vice Chancellor of Research has awarded CS-CASH $40,000 per year for the Pilot Program (Years 2016 through 2021). This funding allows at least 2 additional proposals to be funded each year.

In addition to evaluation plans that are built into individual project proposals, the CS-CASH evaluation team also assesses the progress, outcomes and outputs of each project. The results of these evaluations are shared with the grantees as well as with Dr. Eleanor Rogan, Pilot Program investigator.

CS-CASH has funded Pilot Projects in all 7 of the States served by the Center. Recipients include community organizations, health departments, post-doctoral students, scientific researchers and Ag safety and health organizations.

For a complete list of CS-CASH funded pilot projects please visit: [https://www.unmc.edu/publichealth/cscash/about/List-of-Projects-Years1-7.pdf](https://www.unmc.edu/publichealth/cscash/about/List-of-Projects-Years1-7.pdf). Following are updates on the progress of the projects that received funding in FY07, and projects from FY06 that are still active.
Creating Enduring Resources for Farm Safety Education || Jana Davidson, Progressive Agriculture Foundation.

**Project Aims:**

1. **Identify and recruit individuals that have created unique and effective props for use in farm safety and health education.** We will create videos of these individuals assembling these props from start to finish. Videos will meet the needs of individuals with all learning types, including visual, auditory and kinesthetic.
2. **Allow these videos to be readily available to all interested and currently involved with teaching farm safety.**
3. **To promote these resources, we will market the videos to Progressive Agriculture Safety Day® coordinators and presenters, agriculture teachers and FFA advisors, 4-H educators and volunteer leaders, and others invested in farm safety and health education.**

Upon notification of being awarded an 18-month Central States Center for Agricultural Safety and Health (CS-CASH) Pilot & Feasibility Grant in October of 2017, our team began finalizing the plans to assemble digital resources to facilitate teaching of farm safety and health-related topics. Our initial goal of completing 10 videos emerged into a series of more than 25 videos thanks to the generosity of in-kind donations of time and other services from valued colleagues and partners invested in agricultural safety and health. Additional funding sources allowed us to promote our project throughout North America at various conferences and conventions.

Our video series focuses on the following important safety and health topics: ATV Safety, Rollover Protection Structures (ROPS) and Seatbelts for both vehicles & tractors, PTO Entanglement, Silage Safety, Hearing Safety, Disability Awareness, Reaction Time, Weather Safety, Sun Safety, Reflectivity, Grain Safety, Water Safety, Animal Safety and the use of various other Personal Protective Equipment (PPE) to prevent injury or illness. Our videos focus on one of the following elements:

1. How to build a prop for a safety demonstration
2. How to utilize current existing props for safety demonstrations
3. Where to locate materials or where to purchase materials to build a prop
4. How to use the prop to teach a hands-on activity or demonstration to youth between the ages of 4 and 13

The completion of this project was thanks to the assistance and collaboration with many colleagues invested in agricultural safety and health including: Asmark Institute, CHS, Scott Archer of Dream Big Media Group, Amy Rademaker of Carle Foundation Hospital, Jane Graves and the USDA Illinois Farm Service Agency, Dr. Laura Rice of the University of Kentucky, and Dr. Aaron Yoder and Ellen Duysen, both of the University of Nebraska Medical Center.

The Progressive Agriculture Safety Days® mission is “to provide education, training and resources to make farm and ranch life safer and healthier for children and their communities.”
Our project does just that! Our digital resource collection brings blue prints and designs to life, guiding visual learners in observing the process and assembly of teaching tools first-hand. **Websites or other Internet sites:**

Beginning October 1, 2018, we plan to have all video resources available to the public through the following websites or channels:

- Central States Center for Agricultural Safety and Health website ([https://www.unmc.edu/publichealth/cscash/](https://www.unmc.edu/publichealth/cscash/))
- U.S. Agricultural Safety and Health Centers YouTube channel ([https://www.youtube.com/user/USaqCenters](https://www.youtube.com/user/USaqCenters))
- Progressive Agriculture Foundation website ([www.progressiveag.org](http://www.progressiveag.org))
- Progressive Agriculture Foundation YouTube channel ([https://www.youtube.com/user/ProAgFound](https://www.youtube.com/user/ProAgFound))

**Presentations:**

The Progressive Agriculture Foundation and Progressive Agriculture Safety Day® program staff has had the honor of being accepted to promote and/or present our project at the following venues:

- CS-CASH External Advisory Board Meeting held in Omaha, Nebraska (May, 2018)
- International Society for Agricultural Safety & Health (ISASH) Conference held in Halifax, Nova Scotia (June, 2018)
- CS-CASH Monthly Member Meeting via Zoom (September, 2018)
- National FFA Convention held in Indianapolis, Indiana (October, 2018)
- Midwest Rural Agricultural Safety and Health (MRASH) Conference held in Council Bluff, Iowa (November, 2018)
- Feature in DTN/The Progressive Farmer (November, 2018)
- All 2019 Progressive Agriculture Safety Day® Coordinator Trainings offered at more than 30 locations throughout North America (October 1, 2018 – February 28, 2019). Will reach nearly 500 individuals.
Blue Ribbon Outreach || Julie Rother, Northeast Nebraska Public Health Department's (NNPHD)

Project Aims:

1. Strengthen perception of NNPHD as a trusted, reliable source of occupational health and informational resources that improve quality of life.

2. Research preferences and effectiveness of information technology methods to communicate health, safety, and disaster preparedness information to all agricultural sectors in NNPHD’s four-county service area.

3. Increase NNPHD’s capacity to influence knowledge, practice, and attitudes among those we serve.

4. Disseminate findings to other public health and agricultural worker-related fields.

NNPHD has developed a strong survey tool, with community and partner input and is well on its way to completing the goals of the project. The survey tool has a mixture of knowledge, practice and attitudes about health issues that impact the agricultural community. The survey was tested by NNPHD staff, local and state partners (including CS-CASH members), and NNPHD Board of Health. The survey was translated to Spanish and both language versions are now available on paper, on the NNPHD website and by using a mobile phone through use of a QR code link.

NNPHD staff have participated in several ag-related events throughout the health district to get word out about the survey. As of September 7, 2018, 97 people have completed the survey and 65 of them work in agriculture. Data shows us that 66% report that having a business disaster plan is important or very important but only 36% report that their business has one. We look forward to reporting more results in the coming months.

Surveys were collected during Ag events

Gathering Local Data and Building Ag Partnerships to Better Reach Ag Families || Chris Blanke, Four Corners Health Department

Project Aims:

1. Obtain local data on the health and well-being of local farm families and Ag businesses.

2. Build capacity to support the health, safety, and wellbeing of local farm families, through Ag business partnerships.

A recent study from the University of Iowa found that factors such as poor access to care, isolation, financial stress, and physical pain from working long days, combined with life factors, put farmers at a higher risk for suicide
Obstacles to health care revolve around issues of availability and accessibility. The need for increased access to care (medical and mental) and insurance coverage is especially crucial for rural populations. The high cost of insurance often leads to less preventive care services.

This pilot program is working to address many of these issues. Through new partnerships, such as AgriSafe Network, Four Corners is increasing local access to valuable resources.

During the past year, Four Corners has been actively building relationships with local agricultural-related organizations and events. For the January York Ag Expo, Four Corners partnered with the local hospital and clinic to bring a screening event. The three partners shared a booth for the two-day event, offering screenings for blood pressure, blood sugar, weight, Body Mass Index, and offering colorectal cancer screening kits and radon test kits.

For the March Butler Ag Expo, Four Corners partnered with AgriSafe to host a booth. The two organizations had recently formed a partnership to better reach Ag businesses and families with their resources. The booth was a great opportunity to learn more about each other’s work and to be a visible presence of this newly formed relationship.

Another purpose for the AgriSafe partnership is to adapt their online health risk survey for gathering local data. Four Corners was able to add questions that would help staff better assess the local needs and to assist staff in program planning. These additional questions focused on tobacco and alcohol use, fruit and vegetable consumption, level of physical activity, and access to health care. Staff was able to load local resources into the survey.

In June, Four Corners was invited to host a station at the first York Progressive Agricultural Foundation Day. The focus of the station was poison prevention.

At local county fairs and college events, four corners wanted to share our focus on the health and safety of the agricultural community in a visible way. To that end, CS-CASH loaned Four Corners Health Department Heather the Hearing Mannequin. Using this novel educational tool throughout the summer of 2018, farm families across Nebraska were educated regarding the importance of protecting their hearing.
Identifying the sources of stress and prevalence of anxiety and depression symptoms among young farmers and ranchers in the upper and western Midwest || Dr. Josie Rudolphi

Project Aims:

1. Identify sources of stress among young farmers and ranchers in the upper and western Midwest
2. Estimate the prevalence of symptoms of self-reported anxiety and depression among young farmers and ranchers in the upper and western Midwest
3. Evaluate the association between work stress and anxiety and depression among young farmers and ranchers in the upper and western Midwest.

Agricultural workers are often exposed to stressful working conditions, including hazardous workplaces, unstable economic conditions, and adverse weather conditions. Persistent, chronic stress often leads to anxiety and depression. Estimates of the prevalence of anxiety and depression among farmers and ranchers are inconsistent and often underreported; however, agricultural workers are expected to be increased risk when compared to the general population. Young adult farmers and ranchers (ages 18-35) may be at even greater risk than older, more experienced farmers for developing anxiety and depression. The objectives of this project were to 1) identify sources of stress among young farmers and ranchers in the upper and western Midwest, 2) estimate the prevalence of symptoms of self-reported anxiety and depression among young farmers and ranchers in the upper and western Midwest, and 3) evaluate the association between work stress and anxiety and depression among young farmers and ranchers in the upper and western Midwest.

We developed and pilot tested an online survey to meet the project objectives. We modified the Farm Stress Survey to reflect current agricultural stressors. Results suggest we were able to maintain validity of the Farm Stress Survey and believe the revised instrument could be used for additional populations. We used standardized scales to assess self-reported symptoms of anxiety and depression among young adult farmers and ranchers, which will allow for comparison between young adult farmers and ranchers and the US population.

We partnered with Farm Bureau Young Farmer and Rancher programs in Iowa, Wisconsin, Kansas, and North Dakota to recruit participants into the study. We had 179 useable responses. Finances and time pressures were identified as the stress domains causing the most worry of concern. Almost 70% of participants reported at least mild symptoms of anxiety, and 60% reported at least mild symptoms of depression.

RESULTS/FINDINGS

- Major stressors identified by young adult farmers and ranchers included financial concerns and time pressures.
- Over a third of respondents (35.9%) screened positive for mild generalized anxiety disorder, and 18.2% and 16.5% screened positive for moderate or severe generalized anxiety disorder, respectively.
- Additionally, over a third of respondents (35.9%) screened positive for mild depression, 14.7% screened positive for moderate depression, 10 % screened positive for moderately severe, and 4.7% screened positive for severe depression.
- Finances, time pressures, economics and intrapersonal relationships were associated with anxiety and depression.
SUMMARY AND CONCLUSIONS

- We observed a prevalence of anxiety and depression among young adult farmers and ranchers in the Midwest above that of the US population.
- The prevalence of anxiety was evenly distributed among gender, age, farm type, and major commodity produced.
- The prevalence of depression was evenly distributed among gender, age, farm type, and major commodity produced.
- Certain farm stressors were positively associated with both anxiety and depression.
- Interventions to prevent the onset of and early treatment of anxiety and depression are necessary for the population.

Our results suggest a substantial portion of the young adult farmer and rancher population is burdened by at least mild symptoms of anxiety and/or depression.

Results from Dr. Rudolphi’s research indicates that finances, time pressures, economics and intrapersonal relationships were associated with anxiety and depression in young farmers and ranchers.

(Photo: CS-CASH Photo Sharing site https://www.flickr.com/photos/cscash/)

Peer and non-peer reviewed papers, publications, grant submissions and presentations

1. Rudolphi JM, Berg D, & Parsaik A. Exploring Stressors and Mental Health Status of Young Adult Farmers, in prep.
4. Invited speaker. “Stress on the Farm and Resources Available to Farmers to Improve Mental Health”. American Agri-Women Association, Friday, November 16, 2018, Springfield, IL
Agricultural and Occupational Exposures in U.S. Veterans with Rheumatoid Arthritis and Associations with Disease Severity || Dr. Bryant England

Project Aims:

1. Characterize the associations between agricultural and occupational exposures with RA autoantibody and inflammatory cytokine expression in RA patients, stratifying by genetic background. It is hypothesized that inhalant lung exposures, including agricultural dusts, will be associated with higher rheumatoid factor, anti-cyclic citrullinated peptide antibody, and serum inflammatory cytokine expression. This finding will be independent of smoking history. Associations of inhalant lung exposures with RA autoantibody concentrations will be independent of smoking history and enhanced in those with HLA-DRB1 shared epitope alleles.

2. Determine the association between agricultural and occupational exposures with disease severity and extra-articular disease features in RA patients. It is hypothesized that inhalant lung exposures, including agricultural dusts, will be associated with higher disease activity, poorer functional status, and the presence of extra-articular disease features independent of smoking history in RA patients.

Preliminary Results.

• We are conducting a survey of US Veterans with rheumatoid arthritis to assess prior agricultural and occupational exposures. We have constructed the agricultural and occupational exposure survey by utilizing questions and topics from previous surveys in these areas. These surveys were then built into a scannable form, using technology and information technology support/staff available at UNMC.

• Institutional review board approval was obtained locally at the VA Nebraska-Western Iowa Healthcare System as well as at participating Veterans Affairs Rheumatoid Arthritis Registry Sites (Birmingham, AL; Washington D.C.; Iowa City, IA; Philadelphia, PA; Pittsburgh, PA; Portland, OR; Salt Lake City, UT).

• We have identified the candidate participants by querying the Veterans Affairs Rheumatoid Arthritis Registry and national Veterans Health Administration databases (searching vital status records to ensure all participants are not deceased). We have assembled the survey invitation letters (initial and follow-up), surveys, and return envelopes.

• Initial mailings and reminder mailings have been sent to Veterans, and we are currently receiving and processing the completed the surveys. Next steps will be analyzing the survey results and completing the analyses of agricultural/occupational exposures with RA disease characteristics and severity as outlined in the above Specific Aims.
ATV Aware Pilot Project || Susan Harris-Broomfield, Extension Educator

Project Aims:

1. Gather demographic, knowledge, and behavioral outcomes related to ATV use using a sample of youth through 10 FFA chapters in Nebraska.

2. Influence behavioral intentions of the individuals participating in ATV Aware education.

3. Influence actual behaviors of participants who complete the ATV Aware program.

This pilot project’s aim is to gather data from Nebraska FFA teens regarding their behaviors while operating or riding ATVs using pre- and post-surveys with a short interactive session about proper behaviors and laws. Knowledge improvement and behavior intention data is collected, and approximately six months later, another survey determines if those learned behaviors have changed their actual riding habits. Aims 1 and 2 have been accomplished. Aim 3 data analysis is ongoing.

A total of 294 FFA chapter members from 11 Nebraska FFA chapters participated in the T1 survey. The age range of participants was 12-21, with a majority ranging in age from 14-18. Most participants (60.3%) were male, while 39.7% were female. Most participants (79.1%) indicated they live in a rural area, and 72% reported their family owning an ATV. Results are shown in Table 1.

<table>
<thead>
<tr>
<th>Knowledge Questions</th>
<th>T1 Survey</th>
<th>T2 Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATV designed for 1 person</td>
<td>31.8%</td>
<td>83.2%</td>
</tr>
<tr>
<td>Age 16 is appropriate age</td>
<td>72.3%</td>
<td>97.2%</td>
</tr>
<tr>
<td>Not safe on pavement or gravel</td>
<td>40.2%</td>
<td>96.8%</td>
</tr>
<tr>
<td>Helmet most important gear</td>
<td>93.8%</td>
<td>97.2%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Behavior Questions (T2=intention)</th>
<th>T1 Survey</th>
<th>T2 Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allow passengers</td>
<td>79.9%</td>
<td>60.6%</td>
</tr>
<tr>
<td>Drive recommended size</td>
<td>56.6% didn't know</td>
<td>86.7%</td>
</tr>
<tr>
<td>Never ride on gravel</td>
<td>3.3%</td>
<td>36%</td>
</tr>
<tr>
<td>How often a helmet is worn</td>
<td>70.2% never</td>
<td></td>
</tr>
<tr>
<td>Drivers would wear a helmet if available</td>
<td></td>
<td>56.1%</td>
</tr>
</tbody>
</table>

Feedback from the pilot project was crucial in determining changes to curriculum, and materials were developed for ongoing ATV Aware education in other venues. Through August 31, 2018, the program and simulator traveled to 61 events in three states, achieving 8,614 face-to-face contacts. Events included education for 11 FFA chapters, agriculture safety days for children or teens, health fairs, school visits, employee education, conferences, outdoor sporting expos, farm expos, FFA state and national conventions, county fairs, and 4-H camps.
Development of ion channel blockers for influenza D virus || Hideaki Moriyama

Project Aims:

To develop mathematical models for the behavior of the influenza type D M2 protein based on experimental results. In this proposal, I present the establishment of a mathematical model as the basis for the development of an ion channel blocker for influenza viruses using artificial intelligence (AI) with the purpose to improve agricultural safety in central States. The proposed research will be the foundation of quantitative structure–activity relationship models (QSAR models) with an antiviral design.

Influenza viruses infect humans, birds, and domestic animals via the nose, throat, and sometimes the lung. In humans, the influenza virus causes flu, resulting in mild to severe illness. Flu can occasionally lead to death. Annual vaccination is the most effective strategy to prevent flu. However, once an individual gets infected, antiviral drugs are useful for controlling virus propagation.

The influenza virus has a segmented genome. When multiple influenza virus strains infect the same host, the two genomes are mixed together and sometimes a highly potent virus strain can be generated. For instance, swine can simultaneously get infected with both human and avian influenza viruses. This fact is of primary concern in the central farms of the country.

The influenza virus has three surface proteins, including hemagglutinin (HA), matrix 2 (M2), and neuraminidase (NA). HA is used as vaccine target. M2 and NA are used as antiviral drug targets. The influenza virus has four families, including A, B, C, and D. Among them, the influenza A virus infects a large variety of hosts and causes major outbreaks. The influenza D virus was recently isolated from bovine. Although NA inhibitors are available for treating influenza A and B virus infection, M2 inhibitors are only available for the influenza A virus.

The M2 protein is involved in both the release of the viral genome into the host cell and assembly of newly propagated viruses. Taking these two different points of action as an advantage, I started the study. The influenza D virus is distally related to the A virus and closely related to the C virus.

Results.

- We addressed that the M2 protein of the influenza D virus (DM2) has voltage-gated ion channel activity by performing electrophysiological analyses. The DM2 protein was artificially prepared, and after applying voltage, an inward current was induced. This experiment mimics the initial process of virus uncoating to release the RNA genome into the cell. We modeled the opening and closing of the ion channel using a biophysical model, the Boltzmann equation.
- We demonstrated that amantadine, an approved M2 inhibitor for the influenza A virus, only partially suppresses DM2 activity in our test system. Nevertheless, we found that Dids, an inhibitor of anion conductance, inhibits DM2 activity in our system.
• Those results showed the limit of DM2 action in the mode of gating and inhibition. This is a major step toward the utilization of AI in quantitative structure–activity relationship models (QSAR models) with an antiviral design envisioning a federal-level funding.

Publications.


Presentation.


MAPPER Immersion: Developing an Augmented Reality prototype to Protect Lives and Increase Emergency Responder Effectiveness || Dr. Bryan Weichelt

Project Aims:

1. Integrate Augmented Reality functionality into the Farm MAPPER System.

a) Develop a technological framework that complements the existing suite while building features that leverage new technologies.

b) Recruit and conduct iterative usability testing with future user groups such as firefighters and underwriters.

Farm Mapping to Assist Protect, and Prepare Emergency Responders (Farm MAPPER) is an interactive, device-agnostic, web-based prototype that was developed to provide emergency responders up-to-date information about hazards, resources and the physical environments of agricultural operations.

The project was reinvigorated with pilot funding through the Central States Center for Agricultural Safety and Health. The new effort developed an augmented reality version of Farm MAPPER, available on iOS and Android platforms. Furthermore, the application will live on as part of project advisor Dr. Casper Bendixsen’s 5-year NIOSH-funded study through UMASH, titled Rural Firefighters Delivering Ag Health and Safety. The team’s methods involve a combination of the Farm-MAPPER and FARM-HAT software applications as part of their train-the-trainer model to deploy third party safety training and auditing through firefighters to farms in the Upper Midwest.

The app prototype is now available via iOS (for Apple users) and through Android. Installation instructions for testing and demo videos are available on our website - http://www.marshfieldresearch.org/nfmc/farm-mapper
Published manuscript:


Submitted manuscript:


Pilot Project: Evaluation of Medication-Related Agricultural Injury among Missouri Farmers || Dr. Kelly Cochran

Project Aims:

1. Determine the extent to which farm-related injuries that result in hospital admission or emergency department visit are associated with drug-related problems in the farmers’ home medication regimen.

2. Characterize and measure the frequency of drug-related problems.

A clinical pharmacist and student researcher are collecting medication-related problems from the medical record for cases of farm injury resulting in a hospital admission or emergency department visit. Home medications are a component of the questions asked upon entry to the Level 1 Trauma Center and serve as a jumping off point to evaluate for medication therapy problems or medication taking behaviors that may have been present at the time of the farm injury. The comparison group of farmers in the community, who have not experienced a farm injury resulting in hospital admission or emergency department visit, are being recruited through advertisements located in rural clinics/pharmacies. The data collection of cases and advertisements to recruit controls are ongoing. The revised project timeline was granted an extension and the project is progressing.
Farmer Evaluation of Agricultural Fatality Messaging: Best Practices for Disseminating Prevention Messages Based on FACE Cases || Stephanie Leonard

**Project Aims:**
1. Conduct farmer-led evaluations of existing FACE format fatality investigation reports, hazard alerts, and media articles. We want to understand the message format, content, technical information, and dissemination methods that are most useful to farmers.
2. Develop new prototypes of messages that incorporate the information learned from farmer evaluation (gained in aim 1) and include personal stories from close survivors (family members and coworkers) who are impacted by agricultural injury.
3. Conduct farmer-led follow up evaluations of the materials developed in aim 2 that incorporate survivors experiences and input gained in the first round of evaluations.

The Iowa Fatality Assessment and Control Evaluation Program (IA FACE) has collected information on work-related fatalities occurring in Iowa from 1995 to 2015, one-third of which involved farmers and agricultural workers. This project engages farmers to provide feedback on several formats of IA-FACE prevention messages.

Farmers were enrolled and received two examples each of media articles, hazard alerts, and fatality reports covering incidents involving grain engulfment, anhydrous injury, tractor rollovers, bale handling, and exposure to hydrogen sulfide gas during manure handling. After completing evaluation forms developed to assess content, presentation, clarity, usefulness, and relevance, farmers participated in a focus group (photo) to review their opinions and make suggestions on what further information would improve messaging.

Among the initial focus group findings were preferences for: personal stories and anecdotes, i.e., “hearing from someone affected”; inclusion of “best practices” for prevention, inclusion of technical information when equipment is involved in an incident; and generous use of photos. Participants suggested using agricultural media as their preferred source of trusted information.

Findings are currently being applied in development of new prototypes and are informing *Telling the Story Project* narratives, a collaborative effort of CS-CASH, GPCAH, and UMASH Ag centers. Next steps include completion of new prototypes and follow up evaluation by the focus group.

This project will enhance our knowledge about developing and targeting injury prevention messages. Products developed in this project will be available as resources for farmers and their employees, agricultural safety and health professionals, media outlets and journalists.
Development of a mobile application for agricultural safety, AgHealth || Dr. Joseph Siu

*Project Aims:*

*Develop and validate the AgHealth mobile application and Implement the AgHealth to the farm workers and their healthcare community.*

Farming is one of the most hazardous work in the U.S. The Occupational Safety and Health Administration shows that the fatality rate for agricultural workers is seven times higher than the one for all workers in private industry. Unfortunately, losing balance during farm work has been commonly observed and led to injurious falls. An effective self-balance testing for employers and employees could be helpful to prescreen and routinely check the balance status.

We have revised the interface of the AgHealth (Figure 1) after an initial pilot study. The mobile application is now ready for balance testing while standing and with different walking conditions, e.g. level walking, tandem walking, walking on elevated bar.

The AgHealth contains two critical components – balance assessment and education for farm safety. The AgHealth links to important agricultural safety messages from the National Institute for Occupational Safety and Health (NIOSH) and provides the essential information about how to maintain good balance and prevent falls while working in agriculture.

For balance testing, we used the embedded accelerometer in the mobile device to calculate how fast farmers move and based on their movement to give a score from A (excellent balance) to F (fall). Before using the AgHealth in the farm community, we tested this application to evaluate balance in 20 patients with orthostatic tremor which have balance impairments and 12 healthy controls. The results support that the AgHealth is feasible to measure balance status and also sensitive enough to differentiate the balance status between patients with balance problems and healthy controls. The AgHealth mobile application is currently being used and evaluated by farmers and their healthcare providers in Nebraska.

Figure 1.
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 1) monthly injury and fatality case reports from the Center’s media monitoring service, 2) annual data from the Center’s injury surveillance project, 3) reviews of the literature, and 4) 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-based 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.

The Central States Center for Agricultural Safety and Health (CS-CASH) established an Emerging Issues Program that examines trends in injury and illness hazards and preventive solutions, and provides coordinated responses to emerging issues. With access to the Center’s injury surveillance system, media monitoring service, network of experts and other resources, we are in position to detect emerging issues and respond to them in collaboration with NIOSH, Ag Centers, professional organizations, the extension service, industry, media channels, and our growing email address database of producers in the CS-CASH region.

During the project period, CS-CASH utilized media monitoring to identify emerging issues. These issues were addressed in media products, including a growing database of ‘Ag Stories ready to Go’; available on the Center’s website. [https://www.unmc.edu/publichealth/cscash/news/index.html](https://www.unmc.edu/publichealth/cscash/news/index.html)

We received calls from the media, industry, and health and safety professionals related to specific hazards, particularly after incident reports in the media. With our growing database of injury and fatality cases, we have been able to provide instant feedback to callers about similar incidents in the past, and available information for preventing similar incidents in the future. Summaries of fatalities and injuries in each of the CS-CASH 7 states region can be accessed on the landing page of the website: [https://www.unmc.edu/publichealth/cscash/](https://www.unmc.edu/publichealth/cscash/).

NIOSH Ag Centers partner on “Telling the Story” project.

Outreach specialists from CS-CASH, the Great Plains Center for Agricultural Health and the Upper Midwest Agricultural Safety and Health Center (UMASH) - are collaborating on a translation activity to convey the story of agricultural safety.

While statistics and numbers are important to identify injury trends and emerging issues related to workplace health and safety, Telling the Story (TTS) is creating injury prevention messages that highlight personal stories and are based on first-hand experiences.

Who are the storytellers? Farmers, agricultural workers, and family and community members who’ve been impacted by injuries, fatalities, or close calls. Told in their own words, their experiences, provide valuable information to learn what went wrong and how to prevent or avoid similar incidents. Regardless of the type of incident, the common thread among those telling their stories is “We don’t want this to happen to anyone else.”
The TTS team includes Stephanie Leonard at GPCAH, Scott Heiberger and Melissa Ploeckelman at UMASH, and Aaron Yoder and Ellen Duyse at CS-CASH. Their combined resources bring to the table experience in injury and fatality investigations, occupational safety, interviewing, agricultural extension and outreach, journalism and media communications, and agricultural production.

Telling the Story’s initial interviews and stories focus on a persistent, under-recognized hazard that continues to claim both human and livestock lives in the Midwest: hydrogen sulfide gas released during agitation or transfer of stored manure. The topic is timely due to 2016 farmer fatality that occurred near an open air lagoon, multiple fatalities involving would-be rescuers, and livestock deaths that occurred at open cattle confinement buildings during agitation and pumping. Storytellers include family members who have lost family members and a farm worker who was found by his wife after succumbing to hydrogen sulfide in a swine confinement building. We add important prevention messages aimed to help producers identify the best practices to work safely.

Telling the Story updates will be available on collaborating Ag Centers’ home and Facebook pages [https://www.unmc.edu/publichealth/cscash/Engagement/index.html](https://www.unmc.edu/publichealth/cscash/Engagement/index.html). A dedicated website, [www.tellingthestoryproject.org](http://www.tellingthestoryproject.org), houses multi-media articles that include video interviews, prevention resources, contact and feedback information, and press kits for Ag communicators, the media, Ag educators, and employers. UNMC featured this project on their landing page and sent out a press release: [https://www.unmc.edu/news.cfm?match=22640](https://www.unmc.edu/news.cfm?match=22640).

“But there’s no safety committee on the farm, no safety meetings, no discipline if you don’t follow a safety rule, especially when you’re working alone.” Storyteller Rick Friday shown with wife Juanita.
Abstracts/Presentations Accepted for Scientific Meetings


Media Stories following Telling the Story Project Press Release (August 2018)

Branch R: [2018] Iowa farmer shares his farm accident story. Brownfield Ag News for America. (Radio) July 13, 2018. LINK
Flammini D: [2018] The Telling the Story Project is raising awareness about farm safety. Farms.com, June 28, 2018. LINK
Heiberger S, et al. Things can happen in a blink of an eye. Farm Report with Pam Jahnke (Radio), Madison, WI. August 30, 2018. LINK
Leonard S: [2018] Telling the story project interview with Stephanie Leonard. RFD-TV (Stephanie Leonard Video Interview) July 21, 2018. LINK
Telling the Story, Stephanie Leonard, Iowa Farmer Today, July 2018. LINK

Emerging Issue Pilot Project Funded as Emerging Issue.

Assessing the prevalence and underlying causes of 2015-2017 ATV /OHV-related injuries on U.S. farms || Dr. Bryan Weichelt

Project Aims:

1. Estimate the prevalence of exposure and injuries among farmers and ranchers, including working and non-working youth, in the U.S.

2. Discuss the results in the context of injury prevention, including strategies of parental role modelling, helmet use, alcohol, crush protection devices, and legislation.

The National Highway Traffic Safety Administration (NHTSA) released its initial data about on-road deaths involving motor vehicles in 2016. It also released an updated version of its death data for 2015. In 2016, there were 351 deaths involving ATVs on public roads. In the 2015 updated release, there were 334 deaths involving ATVs on public roads. NHTSA reports ATV fatality based on the Fatality Analysis Reporting System (FARS), which primarily collects police reports involving crashes on public roadways.

Media reports via AgInjuryNews have seen this category of injury source quickly rise to the top among youth (ages 0-17), with ATV /OHV’s being the 2nd leading cause of non-fatal injuries and the leading cause of fatal injuries. With datasets already in hand, our team will analyze and compare youth data
(2015-2017) from the NHTSA and AgInjuryNews.org. Broadly, the goal of this study is to determine the prevalence and underlying causes of ATV/OHV-related injuries in recent years.

In our initial analyses, we will create tables and graphics to summarize and better understand the full range of data collected. Descriptive analyses will be performed. Univariate logistic regression analyses will be performed to evaluate the occupational and non-occupational fatality risk based on gender, age groups, helmet usage, driver/passenger, alcohol.

The results of this study will be discussed and presented in the context of injury prevention, including strategies of parental role modelling, helmet use, alcohol use, crush protection devices, and legislation. Analysis of these two up-to-date datasets (NHTSA/FARS and AgInjuryNews) is expected to unveil findings that can inform agricultural safety and health stakeholders across the Central States region and beyond, from safety trainers to policymakers.

ATVs have shown to be a significant risk of traumatic injury and they have been implicated in over 14,000 deaths between 1982 and 2015. From 1982 through 2015, the US Consumer Product Safety Commission (CPSC) received reports of 3,163 ATV-related fatalities of children younger than 16 years of age, which represents 22% of the total number of reported ATV-related fatalities and of those, 1,380 (44%) were younger than 12 years of age. 6 Children under 16 years old may be 12 times the risk of older adults, and more children in the US are fatally injured riding ATVs than bicycles.

(Photo credit: CS-CASH Photo Sharing site https://www.flickr.com/photos/cscash/)
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.

In 2017 and 2018 the CS-CASH Outreach Program continued a coordinated outreach strategy directed at two primary audiences a) agricultural producers, with a focus on women working in agriculture and b) agricultural, health, and safety professionals. The program was strengthened by working in partnership with members of the AgriSafe Network, USDA Extension, National Agricultural Safety Database, Farm Bureau, agriculture-related magazines and rural newspapers, women in agriculture organizations, agri-insurance agencies, news organizations and close collaboration with other NIOSH funded Agricultural Centers. The Outreach team continues to use the Center’s vast surveillance database to detect emerging issues, allowing a rapid response to immediate concerns affecting the agricultural community, such as flooding on Midwest farms. The Center creates content for distribution, including Internet-based applications; traditional media, including print and radio; and existing human networks that have access to farm families and workers on more than 500,000 farms and ranches in our Center’s region. Our comprehensive 27,000-member database made up of farmers and ranchers, public health officials and safety and health professionals has provided an effective method to reach farmers and ranchers with information on emerging issues as well as with other safety and health information. Face-to-Face outreach continues as an effective method for the Center to demonstrate, train and discuss proven safety and health measures. Social Media has proven to be successful in reaching audiences throughout the year. The CS-CASH Ag Safety and Health Photo Sharing site provides agribusiness, the media and safety professional images for use in the promoting safe practices. The AgriSafe Network continues to address the needs of women in agriculture. Dr. Aaron Yoder has worked with a network of safety, health and information technology experts to evaluate existing technology tools and methods for disseminating information, determining risk and improving safety and health outcomes.
CS-CASH Community Contact Network (CCN). This electronic database currently houses email and address information for 26,211 farmers/ranchers, extension, commodity groups, farm organizations, public health departments, universities, and media outlets who are located in our 7 states region. We have used this valuable resource to disseminate information throughout the year. Newsletters and blasts were sent out during National Farm Safety and Health Week, to announce the annual CS-CASH FFA Video Contest, for Farm Safety Week, to announce the annual Agricultural Safety and Health course and to announce tractor training events. It is an essential resource for reaching agricultural workers with information on emerging issues.

Collaborating with regional organizations. We continue collaborate with numerous organizations located throughout the CS-CASH 7-states region. Examples of collaborative outreach include:

ATV Simulator. Working in collaboration with University of Nebraska - Lincoln Extension, the Nebraska Safety Center, CHI Health and the Nebraska Highway Patrol, CS-CASH has promoted and helped fund a full size ATV simulator that was been used at over 80 events in this reporting period, including at the CS-CASH tractor safety trainings across Nebraska.

The ATV AWARE simulator experience includes discussion of proper PPE, ATV size recommendations, state laws, hazards, injury and fatality statistics and proper body positioning.

Tractor and Equipment Safety Training and Certification. In collaboration with the University of Nebraska – Lincoln Extension, CS-CASH presented tractor and equipment safety training at 10 locations across Nebraska. This two-day certification training graduated 110 students, many of whom, upon completion, worked on farms throughout the summer of 2018. In addition to extensive experiential learning about the safe operation of tractors, ATVs and equipment, students receive training on the proper use of PPE. A local EMT presented emergency medical response training, providing the students with life-saving information. PhD and MPH graduate students from the UNMC College of Public Health assist with the trainings.

The trainings received media coverage at all the 10 sites, including TV interviews and numerous news articles many highlighting the hazards related to tractor roll-overs. Link to television coverage of 2018 Tractor and Equipment Safety Training Course. [https://nebraska.tv/news/local/tractor-safety-course](https://nebraska.tv/news/local/tractor-safety-course)
Cross-Center collaboration. Productive cross-center collaboration continued in 2017-2018.

- Members participated in calls and subgroups of the Evaluator, Coordinator, and Outreach (ECO) team.
- CS-CASH members participate in the leadership of the USAg Centers YouTube group. This has proven to be a successful collaboration between all 11 NIOSH Agricultural Safety Centers. The YouTube channel features 117 videos, produced and peer-reviewed by the Ag Centers including 7 produced by CS-CASH. The channel has had over 340,000 watch time minutes since its inception in 2013. [https://www.youtube.com/user/USagCenters](https://www.youtube.com/user/USagCenters)
- CS-CASH has joined forces with the Great Plains Center for Agricultural Health and the University of Minnesota Agricultural Safety and Health Center to exhibit and present trainings at the Farm Progress Show (IA), Husker Harvest Days (NE), Triumph of Ag (NE), Lake Region Extension Roundup (ND) and the FarmFest (MN). Conducting collaborative outreach brought diverse topics and expertise to these events.

The Nebraska, Iowa and Minnesota Ag Centers joined forces with AgriSafe, ICASH and the Iowa Public Health Department in the Safety Tent at Farm Progress Show in Boone Iowa August 2018. Through this collaboration a wide range of Ag safety and health topics were presented by experts in the field.
**National FFA Convention.** In collaboration with CareerSafe Online, CS-CASH took part in the Safety Exhibit at the National FFA Convention in Indianapolis IN., October 2017. Hearing conservation and ATV safety were the topics of discussion. Over 2500 students took part in the dual trainings over a 3 day period.

![ffa group and atv simulator]

FFA students received information on great ways to conserve their hearing along with samples of PPE and were able to demonstrate what they knew about ATV safety while riding the ATV Aware simulator.

**CS-CASH Ag Safety and Health Photo Sharing Site.** To provide the public, safety and health professionals and educators with access to copyright free, no-cost, high quality images, CS-CASH developed the Ag Safety and Health Photo-Sharing website. This site, accessed through the CS-CASH website and Flickr, hosts images related to agricultural safety and health. This site grew from 707 images to 1029 images in the past year with new images being added on a regular basis. In this reporting period there were 1360 downloads and 143,500 lifetime views. Those downloading pictures are asked to provide information regarding the use of these photos. A word cloud, consisting of the 20 most common responses, is shown in the figure below. Link to the CS-CASH Photo Sharing website: [https://www.flickr.com/photos/cscash/](https://www.flickr.com/photos/cscash/)

Word cloud of the 20 most common responses on the Photo Sharing Website to the question – “What will downloaded photos be used for?”

- materials
- 4-H
- farm safety
- website
- training
- Agricultural
- using
- educational
- curriculum
- safety
- outreach
- materials
- presentations
- farm safety
- Ag
- promotional
- publications
- test
- Health
- report
- social media
- Center

**Social Media.** The CS-CASH website, Facebook Page, and Twitter accounts are important parts of the Center’s social media presence. CS-CASH personnel research and review materials to be included on these sites. These internet and electronic messaging tools provide cost-effective dissemination channels for information produced by the Center projects. These sites are monitored and updated regularly. Facebook followers increased from 207 to 298 in a one-year time-period. In the same period, the CS-CASH website had 14,321 views.
UNMC Masters of Public Health and PhD graduate students are an important part of the CS-CASH Outreach team. Presentations and trainings have provided valuable experiential learning, and having students participate has allowed significantly more Ag safety and health programs to take place. Four students worked on the outreach team in 2017-2018.

Safety and Health Training Course. The 2018 annual weeklong Agricultural Safety and Health Course took place at UNMC College of Public Health with 38 students. From 2011 to 2018, 148 participants have received training as well as academic and continuing education credit through this course. Participants include rural health care professionals, veterinarians, public health professionals and students. Sessions are taught by experts in the field of agricultural and occupational medicine, farm safety and agricultural engineers. The course includes training in respiratory fit-testing and a farm tour. The evaluations for this course have been very good. These trainings are being converted to asynchronous on-demand training modules.

Face to face demonstrations, presentations and materials distribution. CS-CASH outreach personnel participated in agricultural farm shows and agribusiness events in the Center’s seven state region. Outreach took place at Husker Harvest Days (NE), Boone Power Show (IA) FFA Conventions (NE, IA, IN), Custom Harvesters Convention (NE), Triumph of Ag (NE), AgConnect (MO), Women in Agriculture Conferences (NE, IA, MO); Farmfest (MN), Sustainable Ag Conference (SD) and Lake Region Extension Roundup (ND). CS-CASH provides training and demonstrations at these events,
interacting with up to 500 people/day at some of the larger events. This Boots on the Ground outreach, reaches large numbers of farmers and ranchers in all seven of our regional states, encourages long-term community relationships to flourish and valuable new relationships to be established. New focus topics are presented each year. This year the focus was ATV safety, along with respiratory and hearing protection.

**Spanish Language Agricultural Safety and Health Resources**

CS-CASH is working to translate all of their educational resources into Spanish. These materials are available to the public at farm shows, trainings and on the CS-CASH website: [https://www.unmc.edu/publichealth/cscash/news/Spanish-resources.html](https://www.unmc.edu/publichealth/cscash/news/Spanish-resources.html).

Examples of CS-CASH enduring educational materials that have been translated into Spanish. These materials are distributed during outreach events and to participants in the CS-CASH immigrant feedyard project.

**Ag Media.** Ag journalist Loretta Sorensen continues to create media-ready, Ag safety and health related stories for the Ag and rural newspapers, farm journals and radio and television stations. Story content is created using experts in the field with the final copy reviewed by two content experts. Loretta disseminates the articles through Midwestern media sources and the Associated Press. These articles are available to the media and to the public on the CS-CASH website as “Ag Stories Ready to Go”. Link to the articles: [https://www.unmc.edu/publichealth/cscash/news/index.html](https://www.unmc.edu/publichealth/cscash/news/index.html). In the past year these articles have been featured in 437 (recorded) newspapers and online editions. A lightning safety story was run by over 80 news outlets.

**Young and Beginning Farmer Resources.** A safety and health resource page was created for young and beginner farmers. This page provides links to assets including Extension, Ag Risk and Farm Management Library, the 11 NIOSH Agricultural Centers websites, the USAg YouTube Channel, AgrAbility and farm hazard assessment tools. The page can be found on the CS-CASH website: [https://www.unmc.edu/publichealth/cscash/_documents/Ag%20Safety%20and%20Health%20for%20Beginning%20Farmers.pdf](https://www.unmc.edu/publichealth/cscash/_documents/Ag%20Safety%20and%20Health%20for%20Beginning%20Farmers.pdf).
Reducing Health Disparities among Women in Agriculture: A Public Health Approach

The AgriSafe Network is a national non-profit organization representing rural nurses, doctors, researchers, and other professionals who strive to reduce health disparities among farm families. As part of the CS-CASH outreach efforts, AgriSafe built capacity to serve the unique health care needs of farm women.

The long-term goal of this project is to improve the health and safety among female agriculture producers. To meet this goal the AgriSafe Network (AgriSafe) developed campaigns in collaboration with CS-CASH, Women in Agriculture organizations, commodity associations, farm media and FarmHer that include customized occupational health trainings, media messages and a fitness toolkit for women.

FarmHer Partnership

AgriSafe launched a new partnership with FarmHer, a company which documents women in agriculture through photography. AgriSafe presented at "I am FarmHer" Mini Series December 5, 2017 in Sheffield, IA to introduce AgriSafe and its resources for women, including our Women’s fact sheet and the newly revised Women’ s Ag Health Risk Assessment. Linda Emanuel, AgriSafe community nurse, joined two other presenters at a FarmHer health and safety workshop event held in Kansas City in June 2018.

AgriSafe authored two FarmHer Blogs (December and August release) with a focus on healthy habits for the New Year and grain safety during harvest. The new partnership with FarmHer is estimated to reach over 100,000 farm women throughout the US each year.

Exhibiting at Farm Events

AgriSafe partnered with CS-CASH staff at various events throughout Nebraska and Iowa in an effort to raise awareness among farmwomen regarding preventive steps to stay well. CS-CASH generously donated booth space and assisted in creating successful events at several large farm shows.

Trainings on Women’s Health

Thirty minute Women's Wellness Webinars were offered in the fall of 2017 with a focus on health and wellness tips for women in agriculture.

AgriSafe’s team of intern epidemiologists, maternal and child health specialists and our clinical director assisted in the design of the CS-CASH Agricultural Safety and Health Course presentation held in July 2018. The curriculum included latest statistics on health disparities associated with being female and living in a rural location. Linda Emanuel presented at this training.

Backpack of Safety Gear Just for Women

The AgriSafe team was effective in engaging farm women to consider simple steps to improve their health. They created a clear backpack filled with $120 of personal protective equipment designed just for farm women. Items were discussed with event participants. Four backpacks were donated during farm events.
Stories from the Field

AgriSafe created *Stories from the Field* from women farmers. Our goal was to collect and share stories that inspire other women farmers to improve their health and safety while working on the farm. During this fiscal year several women were interviewed in preparation for sharing their transcript and audio recording.

Yoga and Pilates Guides

Designed with women in mind. AgriSafe consulted with a team of yoga and Pilates certified instructors, design experts and professional photographers to produce (the first of its kind) series of poses just for farm women. These poses are simple and can be done on the farm with available tools and structures. They have received a great response at farm events. Each poster is available as a free download off the AgriSafe website. [https://www.agrisafe.org/for-women](https://www.agrisafe.org/for-women).
National Agricultural Safety Database

The National Agricultural Safety Database (NASD) [http://nasdonline.org/](http://nasdonline.org/) receives funding and support as part of the CS-CASH Outreach project. The database was developed in 1993 with funding from the National Institute of Occupational Safety and Health (NIOSH). The information contained in NASD was contributed by safety professionals and organizations from across the nation. Specifically, the objectives of the NASD project are to: provide a national resource for the dissemination of information; educate workers and managers about occupational hazards associated with agriculture-related injuries, deaths and illnesses; provide prevention information; promote the consideration of safety and health issues in agricultural operations; and provide a convenient way for members of the agricultural safety and health community to share educational and research materials with their colleague.

NASD Website Updates

In the past year the carousel or “Jumbotron” on the NASDonline.org homepage was periodically updated to feature new materials to the site and make various announcements. See example above. In this reporting period NASD website had 406,863 users, 466,969 sessions and 584,121 page views.

New Materials Added

New materials were added to the database with the significant content expansions in the area of forestry safety, Ag-related FACE reports, and livestock safety. Thirty-five documents were added representing 454 pages of new content. 30 videos were added, as well as 2 collections and 2 organizations.

Social Media Support

Conceptual Arts, Inc., has also maintained a National Ag Safety Database Facebook page located at [https://www.facebook.com/NASDOnline/](https://www.facebook.com/NASDOnline/). Items of interest to the Ag safety & health community were “posted”, “liked” and/or “shared”. Posts were created to disseminate newly added NASD materials, one of which received a 250 reach. The NASD Facebook page emphasized support for materials and announcements out of the NIOSH affiliated Ag Safety Centers. 235 posts were made. Total page likes increased to 148 as of August 31, 2018.
Evaluation || Dr. Mary Cramer

The Evaluation Team continues to monitor the Center’s progress using the plan established in the initial funding proposal. Several data collection methods and approaches are used to achieve the three specific Aims. The outputs and outcomes are identified below by Aim.

Project Aims:

1. Assess the effectiveness of CS CASH leadership and governance.

Effective governance is important to insure an organization is meeting its goals. Annually, evaluation uses a two methods approach to measure organizational success. A UNMC developed organizational effectiveness instrument survey was conducted with 34 CS-CASH team members responding. In general, CS-CASH governance effectiveness scored a mean score of 6.52 on a seven-point scale. The highest rated construct among respondents was Relationship (mean=6.70), indicating that respondents have a strong sense of trust and value the affiliation with CS-CASH. Activities (mean=6.29) was the lowest rated construct indicating that Center members may be less certain about the degree to which aims/goals and the work plan are implemented in its entirety and on a timely basis. The Center continues to have strong levels of effectiveness in each of the conceptual constructs of a coalition.

Focused field visit interviews followed with seven new pilot investigators, one five year funded investigator and one four year funded investigator to assess Center governance and leadership. This study revealed high levels of satisfaction with the Center governance: “Excellent leadership; strong and “excellent linkage and interaction and transparency that I do not know how you could do more than what you are doing”.

Leadership actions in response to Year 6 suggestions include:

• Scheduling more researchers to go along to farm shows and Center activities: July 2017 UNL Farm Tour and will continue to invite investigators to participate in farms shows etc.

• More support and resources for project publications: Consultation for three pilot projects on publications.

• Improved technology at meetings: ZOOM is a High Definition video conferencing and desktop sharing software, which was adapted by UNMC and available for all CS-CASH meetings.

Specific Year 7 member suggestions for program quality improvement include:

• “…repository of CS-CASH developed tools. An area on the website for researchers to share their surveys, tools etc. with a brief explanation.”

• “…webinar about marketing to the agricultural community because you want to be culturally sensitive and how do you reach engage the small co-ops

• Orientation and actual budgetary process would have been helpful at the start of the funding.

2. Conduct quality assurance by tracking CS CASH Logic Model Activities, Outputs, and Intermediate Outcomes.

The evaluation team received requests to use several UNMC developed survey instruments (ICE© and the Population-based Outcome and End Result Evaluation Survey instrument) from external
researchers on five additional projects. Other evaluation consultation occurred with various groups (new Florida Ag Center and ongoing pilot projects).

A new Social Network Analysis (SNA) survey was developed to identify respiratory Personal Protective Equipment networks involved in moving CS-CASH products and activities to “End Users” described as Ag Workers, Ag Employers and Ag Operators. A total of N=80/207 participated for a 39% response rate. The CS-CASH leadership met to discuss findings and developed a strategic plan to (1) diversify stakeholder connections to groups not widely represented in the current information sharing network (e.g., technology producers; policy makers; government officials; labor, trade, and professional organization leaders; industry administrators and managers; business owners and operators); (2) encourage gatekeepers from the primary network to connect with smaller, unconnected network gatekeepers; and (3) promote more direct communication between individuals within the primary network. A reanalysis will be conducted annually to monitor progress in knowledge diffusion across the network based on these programmatic changes.

An external evaluator, Dr. John Stevenson, Professor Emeritus, University of Rhode Island was hired to review the CS-CASH tracking and evaluation plan and make recommendations. Dr. Stevenson made a site visit in January 2018 and submitted his final report March 15, 2018. His primary recommendations were to 1) continue the comprehensive evaluation plan that has been established, and 2) continue to disseminate our evaluation results and methodologies in peer-reviewed journals and conferences.

3. Evaluate CS CASH Logic Model End Outcomes for social and economic impacts.

A Project Scoring Matrix was developed with leadership input as a baseline in order for Dr. Fernando Wilson (UNMC Health Economist) to calculate a Social Return on Investment (SROI) for the Center in Year 8.

The evaluation team will continue participation with the Ag Centers Evaluator, Coordinator and Outreach (ECO) bi-monthly phone conference meetings to benefit our efforts with resources and shared learnings about evaluation practices.

Outputs for Fiscal Year 7:

Abstracts Accepted for Presentation
1. Wendl, M. Cramer, M, Wilson, F. Project Scoring Matrix to measure Social Return on Investment (SROI)

Publications


Book Chapter

Presentations


Posters
1. Kuwitzky, K., Cramer, M. Wendl, M. Translating Agricultural Respiratory PPE Research to End Users through Social Network Analysis presented at the University of Nebraska Lincoln's undergraduate research fair. April 2018


CS-CASH evaluators Mary Cramer (left) and Mary Wendl (right) present their findings at national agricultural safety and health and evaluator conferences.
CS-CASH Publications/Book Chapters Fiscal Year 7.


Chandra D, Poole JA, Bailey KL, Staab E, Sweeter JM, DeVasure JM, Romberger DJ, Wyatt TA. Dimethylarginine dimethylaminohydrolase (DDAH) overexpression enhances wound repair in airway epithelial cells exposed to agricultural organic dust, Inhalation Toxicology, 2018 May 25; 30:3, 133-139, DOI: 10.1080/08958378.2018.1474976


Kukrety, Shweta P., Parekh, Jai D., Bailey, Kristina. Chronic obstructive pulmonary disease and the hallmarks of aging. Lung India7/1/2018 DOI: 10.4103/lungindia.lungindia_266_17


Poole, Jill A; Nelson, Amy; Warren, Kristi J; Romberger, Debra; Duryee, Michael; et al. Sex Differences Impact the Lung-Bone Inflammatory Response to Repetitive Inhalant Lipopolysaccharide Exposures in Mice. Journal of Allergy and Clinical Immunology, suppl. S; St. Louis Vol. 139, Iss. 2, (Feb 01, 2017): AB188."


